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MINERALS YEARBOOK

Area Reports: International 2005

Africa and the Middle East

Volume III

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MINERALS YEARBOOK

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Volume III

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2005 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Mark D. Myers, Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, International Minerals Section, Minerals Information Team, at (703) 648-7732, or the Team secretary at (703) 648-4961. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals.

Acknowledgments

The Country Specialists in the Minerals Information Team, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the Minerals Information Team.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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THE MINERAL INDUSTRIES OF AFRICA

By Thomas R. Yager, Omayra Bermúdez-Lugo, Philip M. Mobbs, Harold R. Newman, and David R. Wilburn

The 55 independent nations and other territories of continental Africa and adjacent islands covered in this volume encompass a land area of 30.4 million square kilometers, which is more than three times the size of the United States, and were home to 896 million people in 2005. For many of these countries, mineral exploration and production constitute significant parts of their economies and remain keys to future economic growth. Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of bauxite, cobalt, industrial diamond, phosphate rock, platinum-group metals (PGM), vermiculite, and zirconium.

The mineral industry was an important source of export earnings for many African nations in 2005. To promote exports, groups of African countries have formed numerous trade blocs, which included the Common Market for Eastern and Southern Africa, the Economic and Monetary Community of Central Africa, the Economic Community of Central African States, the Economic Community of West African States, the Mano River Union, the Southern African Development Community, and the West African Economic and Monetary Union. Algeria, Libya, and Nigeria were members of the Organization of the Petroleum Exporting Countries (OPEC). The African Union was formally launched as a successor to the Organization of African Unity in 2002 to accelerate socioeconomic integration and promote peace, security, and stability on the continent.

The U.S. Geological Survey (USGS) acknowledges and expresses its sincere appreciation to the following Government agencies, international institutions, and private research organizations for providing minerals production statistics, basic economic data, and mineral exploration and other mineral-related information:

For mineral production statistics—
- Algeria—Ministry of Energy and Mines,
- Botswana—Department of Mines,
- Burundi—Ministry of Energy and Mines,
- Cameroon—National Institute of Statistics,
- Côte d'Ivoire—Corporation for the Development of Mining,
- Eritrea—Department of Mines,
- Ethiopia—Ministry of Mines and Energy,
- Gambia—Geology Department,
- Kenya—Ministry of Environment and Natural Resources,
- Malawi—Department of Mines,
- Mauritius—Central Statistical Office,
- Morocco—Office Cherifien des Phosphates,
- Mozambique—National Directorate of Mines,
- Namibia—Ministry of Mines and Energy,
- Sierra Leone—Ministry of Mineral Resources,
- South Africa—Department of Minerals and Energy, Mineral Economics Directorate,
- Swaziland—Central Statistical Office,
- Tunisia—National Institute of Statistics,
- Uganda—Department of Geological Survey and Mines, and
- Zimbabwe—Chamber of Mines.

For basic economic data—the International Monetary Fund in the United States.

For minerals consumption data—
- British Petroleum plc,
- Department of Minerals and Energy of the Republic of South Africa,
- MEPS (International) Ltd., and
- U.S. Department of Energy in the United States.

For exploration and other mineral-related information—the Metals Economics Group (MEG) in Canada.

General Economic Conditions

In 2005, the real gross domestic product (GDP) of Africa grew by 5.4% after increasing by 5.5% in 2004. From 2000 to 2005, Africa's GDP grew at an average annual rate of about 4.7%. In 2005, the GDP increased by an average of 7.4% in African petroleum-exporting countries and by an average of 4.5% in African petroleum-importing countries. GDP growth in African petroleum-exporting countries was projected to be at or about 6.7% in 2006 and 9.1% in 2007. In petroleum-importing countries, GDP growth was expected to be at or about 4.8% in 2006 and 4.5% in 2007 (International Monetary Fund, 2006a, p. 65, 196).

Investment Data and Political Risk

The Department of Minerals and Energy of the Republic of South Africa reported that investment in newly committed precious metals projects in South Africa (that is, those in which funds had already been committed or were being expended) was $8.26 billion in 2005. An additional $9.56 billion was reported for potential precious metals projects in South Africa (that is, feasibility-level projects for which funds had not yet been committed). PGM accounted for 69% of the investment, and gold, 31%. Potential investment in iron ore projects was at least $950 million. Investment in newly committed processed minerals projects amounted to $681 million, and potential processed minerals projects, $584 million (Mwape and others, 2006, p. 21).

By 2008, capital expenditure for the heavy mineral sands project at Mandena in Madagascar was expected to total $585 million; at Moma in Mozambique, $348 million; and at Kwale in Kenya, $178 million. By 2010, capital expenditures for bauxite and alumina in Guinea were likely to total more than $2.35 billion; nickel in Madagascar, $2.25 billion; and coal in Mozambique, $1 billion. Substantial capital expenditures were also likely for aluminum in Mozambique and South Africa, cobalt and copper in the Democratic Republic of the Congo

[Congo (Kinshasa)] and Zambia, crude petroleum in Nigeria and Sudan, iron ore in Senegal, and natural gas in Nigeria.

Countries directly affected by wars, internal ethnic or political conflicts, and refugee displacements in 2005 included Angola, Burundi, Central Africa Republic, Chad, Congo (Kinshasa), Côte d'Ivoire, Nigeria, Somalia, Sudan, Togo, and Uganda. The Government of Mauritania was overthrown in August.

In April 2005, Argosy Minerals Inc. of Australia withdrew the force majeure that it had imposed at the Musongati nickel deposit in Burundi because of political instability. Argosy resumed work on Musongati because of improvements in the security situation and the decision of the transitional Government to hold elections in 2005.

On December 31, 2004, the Government of Sudan signed a permanent cease-fire agreement with the Sudanese People's Liberation Army, and a comprehensive peace agreement was signed on January 9, 2005. The agreement included protocols on sharing legislative power and natural resources. The agreement did not address the separate conflict in Darfur, which remained unresolved at the end of 2005.

Legislation

In September 2004, the Government of Eritrea ordered a halt to all mineral exploration activity in the country while it reviewed the Mining Act. The Government suspension was lifted in January 2005. The Government increased the maximum possible equity interest that it may hold in a project through an option agreement to 30% from 20%.

Effective February 28, 2005, platinum producers could no longer hold proceeds from Zimbabwean mining activity in foreign accounts to fund exploration and development in that country (Robertson Economic Information Services Limited, 2005). The loss of direct access to these earnings may make it more difficult for foreign companies to fund exploration in Zimbabwe.

At the end of 2004, the Government of Liberia passed legislation providing for controls on the export, import, and transit of rough diamond. In addition, the Government suspended the issuance of all permits for diamond mining and placed a moratorium on alluvial diamond prospecting (United Nations Security Council, 2005).

On December 15, 2005, the Ghanian Parliament passed into law a new Minerals and Mining Bill. The new Minerals and Mining Law, law No. 703, provides for access to mineral rights on a first-come, first-considered basis; a specific timeframe within which all applications should be granted; the right for applicants to demand written reasons from the Minister if an application is rejected; the Government's right to acquire land or authorize its occupation and use if the land is required for mining purposes; the establishment of a cadastral system for the administration of mineral rights; the establishment of the permissible range of royalty rates at not less than 3% or more than 6% of total mining revenues; the Government's right to obtain a 10% free-carried interest in mining leases; and the establishment of the period of duration of a mining lease, which is not to exceed 30 years and which may be renewed once for a period not to exceed an additional 30 years.

In South Africa, the Government's Black Economic Empowerment program required that black ownership of the mining industry reach 15% by 2009 and 26% by 2014. Recent actions to increase black ownership included the acquisition of 20% of Gold Fields Ltd. by black-owned Mvelaphanda Resources Ltd. by 2009; the transfer of mines held by AngloGold Ashanti Ltd. to black-owned African Rainbow Minerals Ltd.; and the acquisition of 30% of Sallies Ltd. by African Renaissance Investments (Pty) Ltd.

Exploration

Exploration activity, as defined by African exploration budgets reported by the MEG, increased to $807 million in 2005 from $572 million in 2004 (Metals Economics Group, 2005). Africa's share of the world exploration budget increased slightly to 16.5% in 2005 from 16.1% in 2004. In 2005, the principal mineral targets in Africa were copper, diamond, gold, and PGM.

African countries that experienced the highest levels of exploration activity in 2005 were, in descending order based on the number of exploration sites as compiled by the USGS, South Africa, Burkina Faso, Ghana, and Zambia, but activity took place in a number of other countries. Gold accounted for approximately 51% of reported African exploration projects, diamond accounted for about 14%, copper and PGM each accounted for about 11%, and nickel accounted for 5%. Early stage projects accounted for about 77% of the 2005 activity, and feasibility stage projects accounted for about 12%.

Australian and Canadian junior companies continued to invest time and money to explore Africa. South African companies continued to expend a sizable amount of their exploration resources outside of South Africa (Creamer Media's Mining Weekly, 2004§[1]).

Commodity Overview

Estimates for production of major mineral commodities for 2005 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2005) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will occur.

Metals

Aluminum and Bauxite and Alumina.—*Production.*—From 2000 to 2005, African production of refined aluminum increased by 54%. In Mozambique, the Mozal smelter was completed in 2000, and the Mozal 2 smelter, in 2003. South Africa's production increased because of the expansion of the Hillside smelter in December 2003. Output also increased in Cameroon and Egypt. In Ghana, the Valco smelter was shut down because of droughts that reduced the country's effective hydropower capacity. South Africa accounted for about 48% of African aluminum output; Mozambique, 32%; and Egypt, 14% (table 6). Kenya was the only African producer of secondary refined aluminum. Africa accounted for 5% of the world's aluminum production in 2005 (table 4).

African bauxite production declined by about 3% from 2000 to 2005. From 1990 to 2005, Africa's share of world bauxite production decreased to 9% from 16%. Guinea accounted for about 95% of African bauxite production; Ghana accounted for most of the remainder (table 5). In 2005, Guinea was the only African producer of alumina.

Consumption.—In 2005, world aluminum consumption amounted to 31.6 million metric tons (Mt) compared with 29.9 Mt in 2004. African consumption of aluminum increased by 3.4% in 2005. In South Africa, aluminum consumption increased to 374,000 t in 2005 from 342,000 t in 2004 (Themba, 2006a).

Outlook.—The production of refined aluminum is expected to rise by an average of about 10% per year from 2005 to 2011. The Mozal 3 smelter in Mozambique and the Coega smelter in South Africa are expected to open in mid-2009 and late 2010, respectively. In Cameroon, Alcan Inc. plans to triple production from its smelter by 2010. Aluminum Smelter Co. of Nigeria Ltd. could reopen its smelter at Ikot Abasi by 2009 and reach full capacity by 2011. In Ghana, Alcoa Inc. plans to increase production at the Valco smelter starting in 2006 (table 6; Mail & Guardian, 2006).

African bauxite production was likely to increase by an average of about 10% per year from 2005 to 2011 (table 5). In Guinea, planned increases in alumina refining capacity of about 5 million metric tons per year in 2008 and 2009 are expected to lead to higher bauxite production. The Sangaredi and the Kamsar refineries are likely to start production in late 2008 and 2009, respectively, and the expansion of the Friguia refinery could be completed in 2009. The reopening of the Sierra Mineral Holdings bauxite mine in 2006 and the restart of mining in the Kambia District in 2010 could increase Sierra Leone's bauxite production to 2.7 Mt in 2011.

Copper.—*Production.*—Africa's mine production of copper increased by 48% from 2000 to 2005. Zambia was the leading producer in Africa; the country's increasing production was attributable to higher output from the Mufulira and the Nkana Mines and the reopening of the Chambishi Mine. The production increase in Congo (Kinshasa) was mostly attributable to the opening of the Lonshi and the Dikilushi Mines in 2001 and 2002, respectively. South Africa's output declined because of lower production from the Palabora Mine and the closure of the Maranda Mine in 2004. In 2005, Zambia accounted for 65% of African copper mine production; South Africa, 15%; and Congo (Kinshasa), 13% (table 7). Africa's share of world copper mine production was 5% in 2005 compared with 14% in 1990.

Africa's refined copper production rose by 40% from 2000 to 2005; increased production from the Bwana Mkubwa and the Mufulira plants in Zambia more than offset lower South African output. In South Africa, production declined because of lower output from the Palabora refinery. In 2005, Zambia accounted for 77% of African refined copper production; South Africa, 19%; and Egypt, 3%. Congo (Kinshasa), which accounted for 37% of continental refined copper output in 1990, had ceased production by 2000 (table 8). Egypt was the only producer of secondary refined copper; primary production accounted for most African production.

Consumption.—In 2005, world refined copper consumption increased to 16.8 Mt from 16.7 Mt in 2004; African consumption of copper amounted to about 170,000 t in 2005. South Africa's consumption declined to 82,000 t in 2005 from 84,000 t in 2004 (Themba, 2006b).

Outlook.—African copper mine production is expected to rise by an average of about 16% per year from 2005 to 2011. Congo (Kinshasa) could account for about one-half of the increase in output. Nikanor plc plans to open the Kananga and the Tilwezembe Mines in 2006 and 2007, respectively, and to restart production at the Kamoto-Oliveira-Virgule (KOV) Mine in late 2009. Central African Mining and Exploration Company plc (CAMEC) is expected to open a new mine during the first quarter of 2008 and to reach full capacity in 2009. Tenke Mining plans to start the Tenke Fungurume project in late 2008. Anvil Mining Ltd. plans to increase production at Kulu in 2006 and to open the Mutoshi Mine in early 2007. Metorex Ltd. is likely to start the Ruashi Tailings project in mid-2006 and the Ruashi Mine in July 2008. Other new sources of production include the Kolwezi Tailings project in 2008 and the Etoile Mine in 2009. The Ruashi Tailings project and the Lonshi Mine are expected to be shut down in 2010.

Output is likely to rise sharply in Zambia because of higher production from the Kansanshi Mine in 2006 and the opening of the Chingola and the Lumwana Mines in 2007 and 2009, respectively. Expansions are planned for the Mufulira, the Mufulira South, and the Nkana Mines in 2007 (table 7).

In Botswana, the Dukwe mine is expected to open in 2009 and to reach full capacity by 2011; production from the Phoenix Mine is likely to triple by 2011. Nevsun Resources Ltd. plans to start mining from a copper-rich zone at Bisha in Eritrea in 2010. In Mauritania, the Guelb Moghrein Mine is expected to start production in late 2006. South Africa's production could increase because of the expansion of the Limpopo PGM mine (table 7).

The production of refined copper is expected to rise by an average of 17% per year from 2005 to 2011. Zambia's production is expected to increase because of higher output from the Mufulira refinery and the Bwana Mkubwa and the Kansanshi solvent extraction-electrowinning (SX-EW) plants in 2006, and the Konkola SX-EW plants by 2007. In Congo (Kinshasa), new SX-EW plants could open at the Kolwezi Tailings project and the Mutoshi Mine in early 2008, and at the KOV Mine in late 2009. CAMEC also plans to start production at the Luita plant in 2008. Congo (Kinshasa), which did not produce refined copper in 2000, could account for more than 25% of Africa's refined copper output by 2011 (table 8).

Gold.—*Production.*—Africa's gold mine production was 522,000 kilograms in 2005, which was a decrease of 14% compared with that of 2000. Production was considerably less than that of 1990 because of the long-term decline in South African production (table 9). From 1990 to 2005, Africa's share of world gold mine production decreased to about 21% from 32% (table 4).

In South Africa, the decrease in production since 2000 was broad based, with output declining at the Great Noilgwa, the Driefontein, the Kloof, the Mponeng, the Savuka, and the Tau Tona Mines. The Ergo, the North West, and the St. Helena Mines were closed. The decline in Ghana's production was partially attributable to lower output at the Bibiani Mine. Output also decreased in Zimbabwe (table 9).

In Tanzania, production increased in recent years because of the opening of the Geita Mine in 2000; the Bulyanhulu Mine in 2001; the North Mara Mine in 2002; the Buhemba Mine in 2003; and the Tulawaka Mine in 2005. Output increased since 2000 in Mali because of the opening of the Loulo, the Morila, and the Yatela Mines. The Mupane and the Samira Hill Mines were opened in Botswana and Niger, respectively; these countries had only artisanal gold production before 2004.

In 2005, South Africa accounted for 56% of African gold production; Ghana, 13%; Tanzania, 10%; and Mali, 8%. South Africa's share of continental gold production continued to decline from 89% in 1990 because of rising production costs associated with deeper underground operations and increased production in Ghana, Guinea, Mali, and Tanzania (table 9).

Outlook.—Gold mine production in Africa is expected to increase by 17% from 2005 to 2009. The long-term decline in South Africa's production could be reversed because of the expected completion of the Moab Khotsong Mine in 2006, the Dominion Mine in 2007, the Tshepong Decline project in 2008, the Phakisa Shaft in 2009, and the planned expansion of the Masimong Mine in 2010. By 2011, these projects could more than offset the shutdown of the Ergo and the North West Mines in 2005, the planned closure of the Crown Mine in 2009, and lower production from the Great Noligwa, the Kopanang, and the Tau Lekoa Mines (table 9).

In Ghana, the outlook is for a substantial increase in output because of the expected opening of the Ahafo Mine in the second half of 2006 and the Akyem Mine in 2008 and higher production from the Chirano and the Wassa Mines. Output is expected to decline at the Bibiani Mine (table 9).

Tanzania's production is likely to rise to 60 t by 2009 with the opening of the Buckreef Mine in 2007 and the Bugwazi Mine in 2008 and the increased capacity at the North Mara Mine; these increases could more than offset the decreased production at the Geita Mine. Production in Tanzania is expected to decline to 56 t by 2011 because of the planned closure of the Tulawaka Mine in 2010. In Mali, the opening of the Tabakoto Mine in 2006 and the reopening of the Syama Mine in 2008 are likely to be offset by the shutdown of the Yatela Mine in 2007 and lower production at the Morila Mine (table 9).

Several African countries that had only artisanal gold production in 2005 are likely to open large-scale gold mines in the near future. By January 2008, production is expected to start at the Bonikro gold deposit in Côte d'Ivoire. In Mauritania, Rio Narcea Gold Mines Ltd. plans to start production at the Tasiast Mine by mid-2007. The Youga and the Taparko Mines are expected to open in Burkina Faso by 2007 and 2009, respectively. Gold-rich zones in the Bisha Mine in Eritrea are planned to be mined from 2008 to 2010. In Congo (Kinshasa), the Kilo Moto Mine could open in 2009. Sudan's only large-scale gold mine is expected to shut down in 2010 (table 9).

Iron and Steel.—*Production.*—African production of crude steel increased by 27% from 2000 to 2005. The majority of the increase was attributable to Egypt. South Africa accounted for 54% of regional crude steel production; Egypt, 32%; Libya, 7%; and Algeria, 6% (table 11). Africa's share of world crude steel production amounted to 2% in 2005 (table 4).

South Africa produced about 7.1 Mt of hot-rolled steel products in 2005, and Libya, 1.67 Mt. Other African producers of hot-rolled steel products included Algeria, Egypt, Morocco, and Tunisia (International Iron and Steel Institute Committee on Economic Studies, 2006, p. 48).

Consumption.—Africa accounted for 2% of the world's finished steel consumption. Africa consumed 18 Mt of finished steel products in 2005 compared with 17.5 Mt in 2004 and 15 Mt in 2000 [MEPS (International), undated§].

Outlook.— Crude steel production is expected to rise by an average of about 5% per year from 2005 to 2011. Nigeria, which accounted for less than 1% of African crude steel output in 2005, could increase its share to 10% by 2011 with the opening of the Ajaokuta plant in 2006 and higher production at the Delta plant. In South Africa, the expansion of the Vanderbijlpark plant is scheduled to take place from 2006 to 2009. In Algeria, increased utilization of existing capacity is expected to raise national steel production to 2.5 Mt by 2011. Production could increase in Zimbabwe as Zimbabwe Iron and Steel Company restores its capacity; improvement in this company's situation depends upon the restoration of economic and political stability (table 11). African consumption of finished steel is expected to rise to 19 Mt by 2008 [MEPS (International), undated§].

Iron Ore.—*Production.*—In 2005, the iron content of ore produced in Africa amounted to 34.8 Mt compared with 32.1 Mt in 2000. Higher production from the Sishen and the Thabazimbi Mines in South Africa more than offset lower output in Egypt and Mauritania. South Africa was the leading iron ore producer in Africa and accounted for 72% of continental output; Mauritania, 21%; and Egypt, 5% (table 10).

Outlook.—The iron content of ore produced in Africa is expected to increase to almost 62 Mt in 2011 (table 10). In South Africa, the expansion of the Sishen Mine is likely to be completed in 2009; a further expansion of the mine could be completed by 2011. Production at the Bruce, the King, and the Mokaning Mines (BKM) could start in 2008; a proposed expansion of the mines could be completed in 2010. The opening of BKM would more than offset the expected decline in output from the Beeshok Mine after 2008. The Faleme iron ore project in Senegal could start production in 2011. In Nigeria, mining is expected to restart at the Ajaybanko and the Itakpe iron ore deposits in 2006 or 2007 and to reach full production by 2009. Output is also expected to increase in Algeria (table 10).

Lead.—*Production.*—From 2000 to 2005, African lead mine production decreased by nearly 39%. South Africa's production declined because of lower production at the Black Mountain Mine and the closure of the Pering Mine in 2003. The decrease in Morocco's output was attributable to the closure of the Touissit Mine in 2002 and technical problems experienced by Compagnie Minere de Guemassa. In Tunisia, the Bouhabeur and the Fej Lahdoum Mines were closed in 2004, and the Bougrine Mine, in 2005. In Namibia, output increased at the Rosh Pinah Mine. In 2005, Morocco and South Africa accounted for 39% each of African lead mine production, and Namibia, 13% (table 12). Africa's share of the world's lead mine production was about 3% in 2005 (table 4).

African production of primary refined lead declined by 45% compared with that of 2000; the decrease may have been attributable to lower lead mine production in Morocco. Production also declined in Algeria. Morocco, which was the leading African producer of primary refined lead, accounted for 88% of continental output (table 13).

From 2000 to 2005, Africa's production of secondary refined lead increased by 34%. South Africa accounted for 86% of African secondary refined lead output; Kenya, Morocco, and Nigeria accounted for the remainder. The share of primary lead in total refined lead production in Africa declined to 35% in 2005 from 64% in 1995 and 72% in 1990 (tables 13, 14).

Consumption.—In 2004 (the latest year for which data were available), world refined lead consumption was about 7.08 Mt compared with 6.8 Mt in 2003. South African lead consumption increased to 80,700 t in 2004 from 78,700 t in 2003 (Maphango, 2005).

Outlook.—The decline in African lead mine production is likely to continue, with output expected to decline by 22% from 2005 to 2011. Most of the decrease would be attributable to the closure of the Bougrine Mine in Tunisia in 2005 and the Rosh Pinah Mine in Namibia by 2010 (table 12). Secondary refined lead production is expected to increase in South Africa in 2006 (table 14).

Nickel.—*Production.*—African mine production of nickel increased by nearly 9% from 2000 to 2005. South Africa accounted for most of the increase in production; output also increased in Botswana and Zimbabwe. The majority of South Africa's nickel output was a coproduct of PGM mining. Higher South African production was partially attributable to increased output from the Nkomati Mine. In 2005, South Africa accounted for 47% of African nickel mine output; Botswana, 43%; and Zimbabwe, 9% (table 15). Minor tonnages of nickel were recovered as a byproduct of cobalt operations in Morocco.

Consumption.—In 2004 (the latest year for which data were available), South Africa's consumption of nickel increased to 25,000 t from 24,000 t in 2003. The stainless steel industry accounted for most of South Africa's nickel demand (Harding, 2006).

Outlook.—Nickel mine production is likely to double from 2005 to 2011. The startup of the Ambatovy nickel and cobalt mine in 2009 in Madagascar is expected to account for the majority of the increase. Madagascar, which did not mine nickel in 2005, could have a 33% share of African nickel mine production by 2011. South Africa's output is expected to nearly double by 2011 because of increased capacity at the Nkomati nickel mine and the Limpopo and the Marikana PGM mines. In Zambia, Albidon Ltd. planned to start production from the Munali project in 2008. Production could increase at the Mimosa PGM mine in Zimbabwe. Botswana's production is likely to decline because of the closure of the Selebi-Phikwe Mine in 2011 or 2012 (table 15).

Platinum-Group Metals.—*Production.*—From 2000 to 2005, Africa's production of palladium and platinum increased by 55% and 47%, respectively. South African production increased because of higher output from the Bafokeng, the Impala, the Kroondal, the Marikana, and the Rustenburg Mines, and the opening of the Modikwa Mine in 2002. Production increased in Zimbabwe because of higher output from the Mimosa Mine and the opening of the Ngezi Mine in 2001. South Africa, which was the continent's dominant producer of PGM in Africa, accounted for 97% and 96% of the production of platinum and palladium, respectively (tables 16, 17).

Outlook.—African mine production of palladium is expected to increase by an average of between 4% and 5% per year from 2005 to 2011, and platinum, by between 3% and 4% per year (tables 17, 18). In South Africa, the increase is likely to be attributable to the opening of the Mototolo Mine in late 2006 and the Two Rivers Mine in 2007; the expansions of the Marula Mine in 2007 and 2009, the Limpopo Mine in 2007 and 2010, the Rustenburg Mine in 2008, and the Nkomati Mine by the end of 2009; and higher production from the Everest, the Kroondal, the Marikana, and the Modikwa Mines. Higher output in Zimbabwe is likely to result from the expansion of the Mimosa and the Ngezi Mines and the opening of the Unki Mine in 2009.

Zinc.—*Production.*—From 2000 to 2005, Africa's mine production of zinc declined by about 17%. The decrease in Morocco's output was attributable to technical problems experienced by Compagnie Minere de Guemassa. In South Africa, the closure of the Pering Mine in 2003 and the Maranda Mine in 2004 more than offset higher output from the Black Mountain Mine. In Tunisia, the Bouhabeur and the Fej Lahdoum Mines were closed in 2004, and the Bougrine Mine, in 2005. Algerian output declined because of the shutdown of El Abed and the Kherzet Youcef Mines. Namibia's production increased because of the opening of the Skorpion Mine; production also restarted at Slag Treatment Plant Lubumbashi in Congo (Kinshasa). In 2005, Morocco accounted for 36% of African zinc mine production; Namibia, 32%; South Africa, 15%; and Tunisia, 7% (table 18). Africa's share of world zinc mine production was about 2% in 2005 (table 4).

African production of zinc metal increased by 85% compared with that of 2000. In Namibia, the Skorpion smelter was opened in 2003. Production declined in Algeria and South Africa. Namibia, which did not produce zinc metal prior to 2003, accounted for 48% of continental zinc metal production in 2005.

South Africa's share declined to 40% in 2005 from 75% in 2000, and Algeria's share, to 12% from 25% (table 19).

Consumption.—In 2005, world refined zinc consumption remained nearly unchanged at about 10.3 Mt. South African zinc consumption increased to 103,000 t in 2005 from 91,000 t in 2004 (Maphango, 2006).

Outlook.—The decline in African zinc mine production was likely to continue, with output declining by 13% from 2005 to 2011. Most of the decrease would be attributable to the closure of the Bougrine Mine in Tunisia in 2005 and the Rosh Pinah Mine in Namibia by 2010 (table 18). In Congo (Kinshasa), the proposed reopening of the Kipushi Mine and the reprocessing of zinc and germanium tailings near Kolwezi could lead to further increases in production, but whether these projects will be implemented by the end of 2011 is uncertain.

Higher production from the Skorpion smelter in Namibia could increase regional production of zinc metal by nearly 8% by 2007. This increase would more than offset the decreased output expected from the Zincor Mine in South Africa (table 19).

Industrial Minerals

Diamond.—*Production.*—In 2005, Africa's share of world diamond production, by volume, was 46% (table 4). African diamond production increased by nearly 51% in 2005 compared with that of 2000. The increase in output was broadly based, with production rising in Angola, Botswana, Congo (Kinshasa), Ghana, Guinea, Lesotho, Namibia, Sierra Leone, South Africa, and Zimbabwe. Production declined in the Central African Republic and Tanzania (table 20).

Congo (Kinshasa) accounted for nearly one-half of the increase in production, by volume. Increased political stability and the Kimberley Process led to higher production by artisanal miners. Sociètè Minièrè de Bakwanga (MIBA) also increased its output, and Sengamines and Midamines SPRL started mining operations in 2001 and 2005, respectively.

In Botswana, production increased at the Jwaneng, the Letlhakane, and the Orapa Mines, and the Damtshaa Mine was opened. In South Africa, production increased at the Finsch, the Kimberley, the Namaqualand, and the Venetia Mines. In Namibia, higher production was attributable to Namdeb Diamond Corporation (Pty) Ltd.'s increased output. The Murowa Diamond Project commenced production in Zimbabwe in 2004. Botswana accounted for 35% of African diamond output by volume; Congo (Kinshasa), 34%; South Africa, 17%; and Angola, 8% (table 20).

In 2005, the global value of rough diamond production amounted to $12.7 billion, of which Africa accounted for about 60%. Botswana accounted for 24% of the value of global rough diamond output; South Africa, 12%; Angola, 11%; Congo (Kinshasa), 8%; and Namibia, 5% (Janse, 2006).

In November 2002, the Kimberley Process Certification Scheme was established to reduce the trade of conflict diamond, particularly diamond originating from Angola, Congo (Kinshasa), and Sierra Leone. The establishment of the Kimberley Process involved Government officials from more than 50 countries that produced, processed, and imported diamond as well as representatives from the European Union, the World Diamond Council, and nongovernmental organizations. As of 2005, the following African countries had met the minimum requirements of the Kimberley Process Certification Scheme: Angola, Botswana, Central African Republic, Congo (Kinshasa), Côte d'Ivoire, Guinea, Lesotho, Mauritius, Namibia, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, and Zimbabwe.

Illicit diamond production controlled by the Kimberley Process focused on Côte d'Ivoire and Liberia in 2005. At the Kimberley Process plenary session held in Moscow in November, the Chair called for action to be taken to help provide technical assistance to countries neighboring Côte d'Ivoire to strengthen controls on diamond trade (Mining Environmental Management, 2005).

Outlook.—The production of rough diamond is expected to increase by an average of nearly 3% per year from 2005 to 2011. In Angola, the Fucauma, the Kamachia-Kamajiku, the Luarica, and the Rio Lapi Garimpo Mines are expected to contribute to higher output. Production could also rise in Congo (Kinshasa) because of the possible expansion of MIBA's facilities by 2010. European Diamonds plc started production in Lesotho in 2005; the company planned to reach full capacity in 2006. Zimbabwe's production could increase because of higher production from Murowa. Output is also expected to rise in Namibia and Tanzania because of expansions at mines operated by DeBeers Group (table 20).

Phosphate Rock.—*Production.*—In 2005, the diphosphorous pentoxide (P_2O_5) content of African phosphate rock production amounted to about 14.6 Mt compared with 12.5 Mt in 2000. The majority of the increase in output was attributable to higher production by Office Cherifien des Phosphates in Morocco; Egypt's production also increased. Morocco, which was the leading producer of phosphate rock in Africa, accounted for 60% of continental phosphate rock output in 2004; Tunisia, 16%; and South Africa, 7% (table 21).

Outlook.—The P_2O_5 content of African phosphate rock production is expected to remain nearly unchanged through 2011. In Morocco, Office Cherifien des Phosphates could complete an expansion by 2009. Production is expected to decline in Algeria and Tunisia (table 21).

Mineral Fuels

Coal.—*Production.*—African coal production increased by 9% from 2000 to 2005; most of the increase was attributable to South Africa. The Goedgevonden, the Mafube, and the Isibonelo Mines opened in 2003, 2004, and 2005, respectively, and production increased at a number of other mines. Output also increased in Botswana, Egypt, Malawi, Niger, Swaziland, and Zambia and decreased in Morocco and Zimbabwe. South Africa, which was the dominant coal producer in Africa, accounted for 98% of regional coal output; Zimbabwe, 1%; and others, less than 1% (table 22). More than 99% of South Africa's coal production was bituminous. Africa accounted for about 5% of total world anthracite and bituminous coal production in 2005.

Consumption.—Africa accounted for about 3% of world coal consumption in 2005. Within the region, South Africa accounted for 92% of African coal consumption. Nearly 71% of South

Africa's coal production was consumed domestically. From 2000 to 2005, Africa's consumption of coal increased by about 12% (British Petroleum plc, 2006, p. 35).

Outlook.—African coal production is expected to increase by an average of 3% per year from 2005 to 2011. South Africa is likely to be responsible for the majority of the increase; its production could increase to 276 Mt by 2011 (table 22). Higher output would be attributable to the opening of the Kriel South Mine in 2005, the Forzando South Mine in 2006, the Mooikraal Mine in mid-2007, and the Inyanda Mine in 2008; and the expansions of the Goedgevonden and the Leeuwpan Mines in 2006, the Syferfontein Mine in 2007, the Mafube Mine in 2008, and the Grootegeluk Mine in 2010.

Mozambique is expected to become the second-ranked coal producer in Africa with the development of the Moatize Project in 2010. Botswana is likely to become the third-ranked producer because of the expansion of the Morupule Colliery in 2008 and the start of production at the Mmamabula East project in 2011. In Zimbabwe, output could increase at Hwange Colliery by 2011 if economic and political stability are restored. Production is also expected to rise in Malawi, Nigeria, and Tanzania (table 22).

Uranium.—*Production.*—In 2005, African uranium mine production increased by 7% compared with that of 2000. Most of the increase was attributable to higher production at the Rossing Mine in Namibia; Niger's output also increased. South Africa's production declined because of lower output from gold mines. Namibia accounted for 46% of African uranium production; Niger, 44%; and South Africa, less than 10%. In 1990, Niger's and South Africa's shares of continental production were 30% and 27%, respectively (table 23). Africa accounted for about 16% of the world's uranium production in 2005 (table 4).

Consumption.—South Africa was the only regional consumer of uranium in 2005. Africa accounted for less than 1% of the electricity generated worldwide by nuclear power (British Petroleum plc, 2006, p. 36).

Outlook.—Continental uranium mine production is expected to rise by 10% per year from 2005 to 2011 (table 23). Namibia's uranium production is likely to increase substantially with the opening of the Langer Heinrich Mine in late 2006 and its planned expansion that could be completed by 2010 or 2011. In South Africa, the Dominion mine is expected to open in 2007 and to produce more than 1,800 t/yr of uranium oxide (U_3O_8) in 2010. AngloGold Ashanti Ltd. plans to increase uranium production from its South African gold mines by 40% by 2009. Paladin Resources Ltd. of Australia plans to produce about 1,500 t/yr of U_3O_8 from the Kayelekera Project in Malawi starting in the third quarter of 2008.

Trade Review and Outlook

Africa's current account surplus amounted to 2.3% of the GDP in 2005; the current account deficit amounted to 0.1% of the GDP in 2004. In 2005, sub-Saharan countries ran an average deficit of 0.6% of the GDP, and countries in the Arab Maghreb Union ran an average surplus of 12.2% of the GDP. Trade surpluses in oil-exporting countries more than offset trade deficits in oil-importing countries (International Monetary Fund, 2006a, p. 65).

Oil-importing countries had an average current account deficit of 3.3% of the GDP in 2005, and oil-exporting countries had an average current account surplus of 12.2% of the GDP. Out of 33 African nations for which information was available, 20 countries experienced a decline in their terms of trade from 2002 to 2005 and 13 experienced an improvement. The countries that experienced the worst decline in their terms of trade were oil importers. However, Botswana's terms of trade improved because higher prices for oil imports were more than offset by higher prices for diamond exports. Similar reasoning held for Mozambique because of higher prices for aluminum; in Niger, for uranium; and in Zambia, for copper (International Monetary Fund, 2006a, p. 65, 67).

The average current account deficit for oil-importing countries is expected to increase to 4.1% of the GDP in 2006 and to 3.8% of the GDP in 2007. For oil-exporting countries, the surplus is predicted to rise to 15.4% of the GDP in 2006 and 15.8% of the GDP in 2007. Africa was expected to run a current account surplus of 3.6% of the GDP in 2006 and 4.2% of the GDP in 2007 (International Monetary Fund, 2006a, p. 65).

In 2004 or 2005, mineral fuels accounted for more than 90% of the export earnings of Algeria, Equatorial Guinea, Libya, and Nigeria. Minerals and mineral fuels accounted for more than 80% of the export earnings of Botswana (led by, in order of value, diamond, copper, nickel, soda ash, and gold), Congo (Brazzaville) (petroleum), Congo (Kinshasa) (diamond, petroleum, cobalt, and copper), Gabon (petroleum and manganese), Guinea (bauxite, alumina, gold, and diamond), Sierra Leone (diamond), and Sudan (petroleum and gold). Minerals and mineral fuels accounted for more than 50% of the export earnings of Mali (gold), Mauritania (iron ore), Mozambique (aluminum), Namibia (diamond, uranium, gold, and zinc), and Zambia (copper and cobalt). Gold was also a significant source of export earnings in Ghana, South Africa, and Tanzania. Diamond was a significant source of export earnings in the Central African Republic and South Africa, as was uranium in Niger (International Monetary Fund, 2005, p. 86; 2006b, p. 67; 2007, p. 25).

Africa's natural gas exporters included Algeria, which accounted for 72% of the continent's natural gas exports; Nigeria, 13%, Egypt, 9%, and Libya, 6%. Europe received 91% of African total natural gas exports and was the destination of 95% of Africa's natural gas exports by pipeline and 88% of Africa's liquefied natural gas (LNG) exports. The United States received 11% of Africa's LNG exports, and countries of the Asia and the Pacific region, 1% (British Petroleum plc, 2006, p. 30).

In 2005, Europe received 35% of Africa's petroleum exports; the United States, 32%; China, 10%; Japan, 2%; and other countries in the Asia and the Pacific region, 12%. West African countries sent 45% of their exports to the United States and 32% to China, Japan, and other countries in the Asia and the Pacific region. North African countries sent 64% of their exports to Europe and 18% to the United States. Intraregional exports to African countries amounted to only 2% of total African petroleum exports (British Petroleum plc, 2006, p. 20).

Intraregional minerals trade was, however, significant for gold. South Africa imported 142,000 kilograms per year of gold mostly from West African countries to supply its gold refinery. A majority of African gold mine production was refined in South Africa prior to export to other regions.

Most of Africa's copper and PGM production was also exported in refined form. The majority of Africa's chromite production was processed into ferrochromium prior to export. For other commodities, which included bauxite, colored gemstones, diamond, iron ore, petroleum, and uranium, most of or all the continent's production was exported prior to downstream processing.

Environment

Deforestation for fuel use and land-intensive agricultural production continued to be a significant environmental issue in many African countries. Other causes of deforestation included artisanal production of gemstones, lime, and sand and gravel. The West African Pipeline Project, which was expected to be completed in 2006, could help mitigate the effects of deforestation in Benin, Ghana, and Togo and reduce the emissions of greenhouse gases. Currently (2005), natural gas was being flared by Nigeria; in the future, Nigeria expected to export natural gas to Benin, Ghana, and Togo. The Government of Nigeria had committed to ending the flaring of natural gas, which would also lead to decreased pollution.

The use of mercury by artisanal gold miners has led to serious air and water pollution in such African countries as Ghana, Kenya, Mozambique, South Africa, Sudan, Tanzania, and Zimbabwe. The Global Environment Facility, the United Nations Development Programme, and the United Nations Industrial Development Organization began the Global Mercury Project in August 2002 to alleviate these problems. The Global Mercury Project has been providing cleaner technologies and training for miners, conducting health assessments, and helping institute government regulatory capacities.

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TABLE 1
AFRICA: AREA AND POPULATION IN 2005[1]

Country	Area[2] (square kilometers)	Estimated population[3] (millions)
Algeria	2,381,740	32.9
Angola	1,246,700	15.9
Benin	112,620	8.4
Botswana	600,370	1.8
Burkina Faso	274,200	13.2
Burundi	27,830	7.5
Cameroon	475,440	16.3
Cape Verde	4,033	0.5
Central African Republic	622,984	4.0
Chad	1,284,200	9.7
Comoros	2,170	0.6
Congo (Brazzaville)	342,000	4.0
Congo (Kinshasha)	2,345,410	57.5
Côte d'Ivoire	322,460	18.2
Djibouti	23,000	0.8
Egypt	1,001,450	74.0
Equatorial Guinea	28,051	0.5
Eritrea	121,320	4.4
Ethiopia	1,127,127	71.3
Gabon	267,667	1.4
Gambia, The	11,300	1.5
Ghana	239,460	22.1
Guinea	245,857	9.4
Guinea-Bissau	36,120	1.6
Kenya	582,650	34.3
Lesotho	30,355	1.8
Liberia	111,370	3.3
Libya	1,759,540	5.9
Madagascar	587,040	18.6
Malawi	118,480	12.9
Mali	1,240,000	13.5
Mauritania	1,030,700	3.1
Mauritius	2,040 [4]	1.2
Mayotte	374	0.2
Morocco	446,550	30.2
Mozambique	801,590	19.8
Namibia	825,418	2.0
Niger	1,267,000	14.0
Nigeria	923,768	132
Reunion	2,517	0.8 [2]
Rwanda	26,338	9.0
Sao Tome e Principe	1,001	0.2
Senegal	196,190	11.7
Seychelles	455	0.1
Sierra Leone	71,740	5.5
Somalia	637,657	8.2
South Africa	1,219,912	45.2
Sudan	2,505,810	36.2
Swaziland	17,363	1.1
Tanzania	945,087	38.3
Togo	56,785	6.1
Tunisia	163,610	10.0
Uganda	236,040	28.8

See footnotes at end of table.

TABLE 1--Continued

AFRICA: AREA AND POPULATION IN 2005[1]

Western Sahara	266,000	0.3 [2]
Zambia	752,614	11.7
Zimbabwe	390,580	13.0
Total	30,360,083	896
United States[5]	9,631,418	297
World	148,940,000	6,440

NA Not applicable.

[1] Table includes data available through February 2007. Population estimates are rounded to no n than three significant digits; may not add to totals shown.

[2] Source: U.S. Central Intelligence Agency, World Factbook 2005.

[3] Source: World Bank 2005, World Development Indicators Database.

[4] Includes Agalega Islands, Cargados Carajos Shoals (Saint Brandon), and Rodriguez.

[5] Includes only the 50 States and the District of Columbia.

TABLE 2

AFRICA: ECONOMY IN 2005[1, 2]

Country	Estimated GDP (billions)[3]	Estimated GDP per capita[3]	Real GDP annual percentage change[4]
Algeria	$237.7	$7,189	5.3%
Angola	43.4	2,813	14.7%
Benin	8.7	1,176	3.9%
Botswana	18.1	11,410	3.8%
Burkina Faso	16.8	1,285	4.8%
Burundi	5.5	739	0.9%
Cameroon	43.2	2,421	2.6%
Cape Verde	3.1	6,418	5.5%
Central African Republic	4.6	1,128	2.2%
Chad	13.7	1,519	5.6%
Comoros	1.1	1,889	2.8%
Congo (Brazzaville)	4.6	1,369	9.2%
Congo (Kinshasa)	46.5	809	6.6%
Côte d'Ivoire	27.5	1,510	-0.3%
Djibouti	1.6	2,253	3.2%
Egypt	305.3	4,317	4.9%
Equatorial Guinea	18.8	16,507	18.6% [5]
Eritrea	4.0	858	4.8%
Ethiopia	60.1	823	8.7%
Gabon	9.6	7,055	2.2%
Gambia, The	3.0	2,002	5.0%
Ghana	55.2	2,643	5.8%
Guinea	18.9	2,035	3.0%
Guinea-Bissau	1.2	736	3.5%
Kenya	48.3	1,445	2.8%
Lesotho	5.0	2,113	1.2%
Liberia	3.4	1,033	5.3%
Libya	67.2	11,624	3.5%
Madagascar	16.2	908	4.6%
Malawi	7.7	596	2.6%
Mali	14.4	1,154	5.4%
Mauritania	7.2	2,535	5.4%
Mauritius	16.0	12,895	4.5%
Mayotte	0.5 [5, 6]	2,600 [5, 6]	NA
Morocco	135.7	4,503	1.6%
Mozambique	27.0	1,379	7.7%
Namibia	15.1	7,478	3.5%
Niger	11.0	872	4.5%
Nigeria	173.8	1,188	6.9%
Reunion	4.8 [5]	6,200 [5]	2.5% [5]
Rwanda	12.2	1,380	5.0%
Sao Tome e Principe	0.3	1,547	3.0%
Senegal	20.5	1,759	6.2%
Seychelles	1.0	12,059	-2.3%
Sierra Leone	4.9	903	7.5%
Somalia	4.8 [5]	600 [5]	2.4% [5]
South Africa	570.2	12,161	4.9%
Sudan	84.8	2,522	8.0%
Swaziland	5.7	5,245	1.8%
Tanzania	27.1	723	7.0%
Togo	9.4	1,675	2.8%
Tunisia	83.7	8,255	4.2%
Uganda	43.3	1,501	5.6%

See footnotes at end of table

TABLE 2--Continued
AFRICA: ECONOMY IN 2005[1,2]

Western Sahara	NA	NA	NA
Zambia	10.8	931	5.1%
Zimbabwe	30.6	2,607	-7.1%
Total	2,414.5	3,027.0	NA
United States	12,278	41,399.4	3.5%
World	55,655	NA	3.6%

NA Not available

[1] Source: International Monetary Fund, World Economic Outlook Database, April 2006.

[2] Table data compiled in February 2007 and may differ from data presented in individual country chapters, which were written previously.

[3] Gross domestic product (GDP) based on purchasing power parity.

[4] Real GDP annual percentage change compared with 2004.

[5] Source: U.S. Central Intelligence Agency, World Factbook 2005.

[6] 2003 estimate.

TABLE 3
SELECTED SIGNIFICANT AFRICAN EXPLORATION SITES IN 2005

Country	Type[1]	Site	Commodity[2]	Company	Resource[2, 3]	Exploration[4]
Botswana	F	Dukwe	Cu	African Copper plc.	94,000 t Cu	Extensive drilling.
Do.	E	Orapa/AK6	Diamond	African Diamonds plc.	Data not released	Extensive work program.
Burkina Faso	E	Belahouro	Au	Goldbelt Resources Ltd.	933,000 oz Au	Extensive drilling.
Do.	E	Essakan	Au	Orezone Resources Inc.	2.4 Moz Au	Do.
Do.	E	Sega	Au	do.	Data not released	Do.
Egypt	F	Sukari	Au	Centamin Egypt Ltd.	3.09 Moz Au	Feasibility drilling.
Eritrea	E	Asmara area	Au, Cu, Ag, Zn	Sunridge Gold Corp.	Data not released	Extensive drilling.
Do.	E	Bisha	Au, Ag, Cu, Zn	Nevsun Resources Ltd.	(5)	Do.
Ghana	D	Akyem	Au	Newmont Mining Corp.	5.4 Moz Au	Do.
Guinea	F	Kouroussa	Au	Cassidy Gold Corp.	433,000 oz Au	Do.
Senegal	F	Sabodala	Au	Mineral Deposits Ltd.	Data not released	Do.
South Africa	E	Akanani	PGM, Au	AfriOre Ltd.	Data not released	Do.
Do.	E	Drenthe	PGM, Au	Anooraq Resources Corp.	7.7 Moz Pd and Pt + Au	Do.
Do.	E	Leeukop	PGM, Au	African Platinum plc.	13.8 Moz Pd and Pt + Au	Do.
Do.	E	Western Bushveld	PGM, Au	Platinum Group Metals Ltd.	1.3 Moz Pd, Pt, and Rh + Au	Do.
Tanzania	E	Buzwagi	Au	Barrick Gold Corp.	Data not released	Do.
Zambia	D	Lumwana	Cu, Co, Au	Equinox Minerals Corp.	2.2 Mt Cu, 57,000 t Co, 173,000 oz Au	Do.
Do.	F	Munali/Enterprise	Ni, PGM	Albidon Ltd.	97,000 t Ni, 223,000 oz PGM	Feasibility drilling.

[1] D--Approved for development; E--Active exploration; F--Feasibility work ongoing or completed.

[2] Abbreviations used in this table for commodities include the following: Ag-silver; Au--gold; Co--cobalt; Cu--copper; Ni--nickel; Pd--palladium; PGM--platinum-group metals; Pt--platinum; Rh--rhodium; Zn--zinc. Abbreviations used in this table for units of measure include the following: Moz--million troy ounces; Mt--million metric tons; oz--troy ounces; t--metric tons.

[3] Based on 2005 data reported from various sources; values vary from measured reserves to identified resources. Data not verified by the U.S. Geological Survey.

[4] Sites where extensive (greater than 10,000 meters) drilling or significant (more than US$5 million) expenditures have been reported.

[5] Content of principal metals is 1.4 Moz Au, 30.9 Moz Ag, 375,000 t Cu, 878,000 t Zn.

TABLE 4
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

Country	Metals									
	Aluminum		Chromite, mine output, gross weight	Cobalt, mine output, Co content (metric tons)	Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron and steel		Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content
	Bauxite	Metal[2]					Iron ore, gross weight	Steel, crude		
Algeria	--	--	--	--	--	697 ^{p}	1,579 ^{p}	1,007 ^{p}	--	--
Angola	--	--	--	--	--	--	--	--	--	--
Benin	--	--	--	--	--	20	--	--	--	--
Botswana	--	--	--	--	31 ^{e}	2,709	--	--	--	--
Burkina Faso	--	--	--	--	--	1,397	--	--	--	--
Burundi	--	--	--	--	--	3,905	--	--	--	--
Cameroon	--	90	--	--	--	1,500 ^{e}	--	--	--	--
Cape Verde	--	--	--	--	--	--	--	--	--	--
Central African Republic	--	--	--	--	--	7 ^{e}	--	--	--	--
Chad	--	--	--	--	--	150 ^{e}	--	--	--	--
Comoros	--	--	--	--	--	--	--	--	--	--
Congo (Brazzaville)	--	--	--	--	--	20 ^{e}	--	--	--	--
Congo (Kinshasa)	--	--	--	22,000	92	4,200 ^{e}	--	130	--	--
Côte d'Ivoire	--	--	--	--	--	1,638	--	--	--	--
Djibouti	--	--	--	--	--	--	--	--	--	--
Egypt	--	244	--	--	--	--	2,600 ^{e}	5,600 ^{e}	--	8 ^{e}
Equatorial Guinea	--	--	--	--	--	200 ^{e}	--	--	--	--
Eritrea	--	--	--	--	--	25	--	--	--	--
Ethiopia	--	--	--	--	--	3,900 ^{e}	--	--	--	--
Gabon	--	--	--	--	--	300 ^{e}	--	--	--	1,290
Gambia, The	--	--	--	--	--	--	--	--	--	--
Ghana	726	13 ^{e}	--	--	--	66,852	--	--	--	600 ^{e}
Guinea	15,200 ^{e}	--	--	--	--	15,300	--	--	--	--
Guinea-Bissau	--	--	--	--	--	--	--	--	--	--
Kenya	--	2 ^{e}	--	--	--	616	(3)	--	--	--
Lesotho	--	--	--	--	--	--	--	--	--	--
Liberia	--	--	--	--	--	16	--	--	--	--
Libya	--	--	--	--	--	--	--	1,260	--	--
Madagascar	--	--	140	--	--	5	--	--	--	--
Malawi	--	--	--	--	--	--	--	--	--	--
Mali	--	--	--	--	--	44,230	--	--	--	--
Mauritania	--	--	--	--	--	--	11,000 ^{e}	5 ^{e}	--	--
Mauritius	--	--	--	--	--	--	--	--	--	--
Morocco and Western Sahara	--	--	--	1,100 ^{e}	3 ^{e}	1,786	8	5 ^{e}	42,200 ^{e}	9
Mozambique	10	555	--	--	--	63	--	--	--	--
Namibia	--	--	--	--	10	2,703	--	--	14,320	--
Niger	--	--	--	--	--	3,005	--	--	--	--
Nigeria	--	--	--	--	--	30 ^{e}	--	40 ^{e}	(3) ^{e}	--

See footnotes at end of table.

TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

	Metals--Continued									
	Aluminum		Chromite, mine output, gross weight	Cobalt, mine output, Co content (metric tons)	Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron and steel		Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content
Country	Bauxite	Metal[2]					Iron ore, gross weight	Steel, crude		
Reunion	--	--	--	--	--	--	--	--	--	--
Rwanda	--	--	--	--	--	--	--	--	--	--
Sao Tome e Principe	--	--	--	--	--	--	--	--	--	--
Senegal	--	--	--	--	--	600 e	--	--	--	--
Seychelles	--	--	--	--	--	--	--	--	--	--
Sierra Leone	--	--	--	--	--	53	--	--	--	--
Somalia	--	--	--	--	--	--	--	--	--	--
South Africa	--	851 p	7,494 p	400 e	104 p	294,671 p	39,542 p	9,493 p	42,159 p	2,100 p
Sudan	--	--	26	--	--	4,728	--	--	--	--
Swaziland	--	--	--	--	--	--	--	--	--	--
Tanzania	--	--	--	--	3	52,236	--	--	--	--
Togo	--	--	--	--	--	--	--	--	--	--
Tunisia	--	--	--	--	--	--	206 p	66 p	8,708 e	--
Uganda	--	--	--	--	--	46	--	7 e	--	--
Zambia	--	--	--	9,300 e	447	440	--	--	--	--
Zimbabwe	--	--	668 p	--	3 p	14,024 p	377 p	119 e	--	--
Total	15,900	1,760	8,330	32,800	693	522,000	55,300	17,700	107,000	4,010
Share of world total	9%	5%	44%	57%	5%	21%	4%	2%	3%	39%
United States	NA	2,480	--	--	1,140	261,000	54,400	93,300	426,000	--
Share of world total	NA	7%	--	--	8%	11%	4%	8%	13%	--
World total	172,000	37,000	18,800	57,700	15,000	2,470,000	1,530,000	1,130,000	3,360,000	10,400

See footnotes at end of table.

TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

Country	Metals--Continued	Industrial minerals				Mineral fuels		
	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Diamond, natural (thousand carats)[4]	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42-gallon barrels)	Uranium, U_3O_8 content (metric tons)
Algeria	4,463 [p]	12,800 [e]	--	--	878 [p]	--	611,950 [p]	--
Angola	--	800 [e]	7,000 [5, 6]	--	--	--	456,250	--
Benin	--	250 [e]	--	--	--	--	--	--
Botswana	--	--	31,890 [7]	--	--	985	--	--
Burkina Faso	--	30 [e]	--	--	2 [e]	--	--	--
Burundi	--	--	--	--	--	--	--	--
Cameroon	--	1,000 [e]	--	--	--	--	21,900	--
Cape Verde	--	--	--	--	--	--	--	--
Central African Republic	--	--	380 [e]	--	--	--	--	--
Chad	--	--	--	--	--	--	63,300	--
Comoros	--	--	--	--	--	--	--	--
Congo (Brazzaville)	--	--	--	--	--	--	92,550	--
Congo (Kinshasa)	--	410	30,300	--	--	1 [e]	10,000	--
Côte d'Ivoire	--	650 [e]	300 [e]	--	--	--	14,574	--
Djibouti	--	--	--	--	--	--	--	--
Egypt	--	29,000	--	--	2,730	75 [e]	218,000 [e]	--
Equatorial Guinea	--	--	--	--	--	--	144,000 [e]	--
Eritrea	--	45 [e]	--	--	--	--	--	--
Ethiopia	--	1,568	--	--	--	--	--	--
Gabon	--	260 [e]	1 [e]	--	--	--	85,469	--
Gambia, The	--	--	--	--	--	--	--	--
Ghana	--	1,900 [e]	1,063	--	--	--	2,190 [e]	--
Guinea	--	360 [e]	550	--	--	--	--	--
Guinea-Bissau	--	--	--	--	--	--	--	--
Kenya	--	2,123	--	--	--	--	--	--
Lesotho	--	--	37	--	--	--	--	--
Liberia	--	40 [e]	10 [e]	--	--	--	--	--
Libya	--	3,600 [e]	--	--	--	--	620,000 [e]	--
Madagascar	--	180 [e]	--	15,000 [e]	--	--	--	--
Malawi	--	120 [e]	--	--	--	49 [e]	--	--
Mali	--	--	--	--	--	--	--	--
Mauritania	--	300 [e]	--	--	--	--	--	--
Mauritius	--	--	--	--	--	--	--	--
Morocco and Western Sahara	77,100	11,000 [e]	--	--	28,788	(3) [e]	245	--
Mozambique	--	400 [e]	--	--	--	3	--	--
Namibia	68,000 [e]	--	1,902	--	--	--	--	3,711
Niger	--	54 [e]	--	--	--	183 [e]	--	3,647

See footnotes at end of table.

TABLE 4—Continued

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

	Metals--Continued	Industrial minerals				Mineral fuels		
Country	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Diamond, natural (thousand carats)[4]	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42-gallon barrels)	Uranium, U_3O_8 content (metric tons)
Nigeria	--	2,400 e	--	--	--	9 e	923,500	--
Reunion	--	380 e	--	--	--	--	--	--
Rwanda	--	100	--	--	--	--	--	--
Sao Tome e Principe	--	--	--	--	--	--	--	--
Senegal	--	1,700 e	--	--	1,455	--	--	--
Seychelles	--	--	--	--	--	--	--	--
Sierra Leone	--	172	669	--	--	--	--	--
Somalia	--	--	--	--	--	--	--	--
South Africa	32,112	--	15,776	--	2,577	245,007	7,277	795 p
Sudan	--	280 e	--	--	--	--	120,000	--
Swaziland	--	--	--	--	--	222 e	--	--
Tanzania	--	1,375	220	--	7	75	--	--
Togo	--	800 e	--	--	1,021	--	--	--
Tunisia	15,889	6,691	--	--	8,220	--	26,200 p	--
Uganda	--	630 e	--	--	--	--	--	--
Zambia	--	435 e	--	--	--	240 e	--	--
Zimbabwe	--	400 e	--	4,298	46	2,891	--	--
Total	198,000	82,300	90,400	19,300	45,700	250,000	3,420,000	8,150
Share of world total	2%	4%	46%	2%	31%	5%	13%	16%
United States	748,000	101,000	--	--	35,800	950,000	5,690,000	1,220
Share of world total	8%	4%	--	--	24%	20%	21%	2%
World total	9,560,000	2,310,000	196,000	1,010,000	149,000	4,850,000	26,600,000	50,900

[e] Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. [p] Preliminary. NA Not available. -- Zero or zero percent.

[1] Totals may not add owing to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of March 2007.

[2] Primary and secondary production.

[3] Less than 1/2 unit.

[4] Gemstones and industrial diamond.

[5] Does not include smuggled production.

[6] Production was approximately 90% gem and 10% industrial grade.

[7] Assumed to contain about 70% gem and near gem.

TABLE 5
AFRICA: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Ghana	381	513	504	726	700	700	700
Guinea	15,800	15,800	15,700	15,200	15,200	25,000	25,000
Mozambique	7	11	8	10	10	10	10
Sierra Leone	1,430	--	--	--	1,200	1,200	2,700
Total	17,600	16,300	16,200	15,900	17,100	27,000	28,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 6
AFRICA: HISTORIC AND PROJECTED PRIMARY ALUMINUM PRODUCTION, 1990-2011

(Thousand metric tons)

Country[1]	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Cameroon	93	79	86	90	90	90	260
Egypt	179	180	189	244	250	250	250
Ghana	174	135	137	13	120	120	120
Mozambique	--	--	54	555	550	690	830
Nigeria	--	--	--	--	--	100	190
South Africa	159	229	673	851	860	860	1,520
Total	600	630	1,100	1,800	1,900	2,100	3,200

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Kenya also produced about 2,000 metric tons per year of secondary refined aluminum.

TABLE 7
AFRICA: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2011

(Metal content in thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Botswana	25	25	35	31	35	60	90
Congo (Kinshasa)	509	29	31	92	160	490	590
Eritrea	--	--	--	--	--	--	70
Mauritania	--	--	--	--	30	30	30
Morocco	16	14	7	3	3	3	3
Namibia	28	23	6	10	25	25	25
South Africa	179	166	137	104	107	108	115
Tanzania[1]	--	--	--	3	4	4	4
Zambia	519	316	249	447	700	800	800
Zimbabwe	14	9	2	3	2	2	2
Total	1,300	580	470	690	1,100	1,500	1,700

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Copper contained in concentrates and doré.

TABLE 8
AFRICA: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Botswana	--	--	--	(1)	--	5	20
Congo (Kinshasa)	339	35	--	--	--	180	340
Egypt[2]	4	4	4	14	14	14	14
South Africa	133	124	126	100	105	105	113
Zambia	438	328	227	398	500	800	800
Zimbabwe	14	7	10	2	--	--	--
Total	930	500	370	500	600	1,100	1,300

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Pilot plant production only.

[2] Egypt produced secondary refined copper; primary production in all other African countries.

TABLE 9
AFRICA: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2011

(Metal content in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Algeria	--	--	--	697	1,000	1,500	1,500
Benin[1]	--	300	--	20	20	20	20
Botswana	46	86	4	2,709	3,000	3,000	3,000
Burkina Faso	7,800	1,319	625	1,397	2,650	7,700	8,300
Burundi	9	2,000	--	3,905	3,900	3,900	3,900
Cameroon[2]	10	800	1,000	1,500	1,500	1,500	1,500
Central African Republic	241	97	15	7	10	10	10
Chad	--	--	120	150	50	50	50
Congo (Brazzaville)	7	10	10	20	10	10	10
Congo (Kinshasa)	9,300	1,180	69	4,200	4,200	7,900	11,700
Côte d'Ivoire	20	1,983	3,444	1,638	8,900	8,900	8,900
Equatorial Guinea	50	50	500	200	200	200	200
Eritrea	--	59	264	25	25	13,200	840
Ethiopia	848	4,500	3,206	3,900	5,300	5,400	5,400
Gabon	80	70	70	300	300	300	300
Ghana	16,800	53,087	72,080	66,852	88,600	100,000	100,000
Guinea	6,340	7,863	15,788	15,300	15,300	15,300	15,300
Kenya	25	170	1,243	616	600	600	600
Liberia	600	800	25	16	20	20	20
Madagascar	216	38	5	5	5	5	5
Mali	5,200	3,996	28,717	44,230 [3]	51,900	49,200	49,200
Mauritania	--	1,196	--	--	3,300	3,300	3,300
Morocco	500	580	505	1,786	1,800	2,700	2,700
Mozambique	63	6,800	23	63	70	70	70
Namibia	1,610	2,394	2,417	2,703	2,500	2,500	2,500
Niger	--	1,000	25	3,005	3,000	3,000	3,000
Nigeria	--	5	52	30	30	30	30
Rwanda	2,160	26	10	--	--	--	--
Senegal	--	--	550	600	600	600	600
Sierra Leone	32	4	--	53	50	50	50
South Africa	605,000	523,809	430,800	294,671	290,000	307,000	312,000
Sudan	100	3,700	5,774	4,728	4,400	2,700	--
Tanzania	3,500	320	15,060	52,236	51,000	60,000	56,000
Uganda	--	1,506	56	46	50	50	50
Zambia	129	91	600	440	--	--	--
Zimbabwe	16,900	23,959	22,069	14,024	10,000	12,000	20,000
Total	678,000	644,000	605,000	522,000	554,000	610,000	610,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] From artisanal mining.

[2] Excludes artisanal mining which, in 2005, was estimated to be 2,000 kilograms.

TABLE 10
AFRICA: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 1990-2011

(Metal content in thousand metric tons)

Country	Average grade[1]	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Algeria	50%	1,470	1,100	820	790	800	900	1,000
Egypt	55%	1,330	1,120	1,900	1,600	1,600	1,600	1,200
Liberia	57% to 64%	2,490	--	--	--	--	--	--
Mauritania	59% to 72%	6,800	7,000	7,500	7,200	7,200	7,200	7,200
Morocco	54%	90	32	4	4	4	4	4
Nigeria	36%	138	62	9	--	500	1,800	1,800
Senegal	42% to 59%	--	--	--	--	--	--	6,300
South Africa	62% to 65%	19,800	19,800	21,570	24,900	25,500	35,000	44,100
Tanzania	32%	--	14	--	--	--	--	--
Tunisia	54%	154	122	98	108	90	70	50
Uganda	61% to 67%	--	--	3	--	--	--	--
Zimbabwe[2]		730	160	225	185	150	120	200
Total		33,000	29,400	32,100	34,800	35,800	46,700	61,900

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to total shown. -- Negligible or no production.

[1] Direct shipping ore and concentrate.

[2] Average iron content for Zimbabwe prior to 1996 was 61%. Since 1996, the average grade has been 51%.

TABLE 11
AFRICA: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Algeria	836	827	842	1,007	1,700	1,700	2,500
Angola	10	--	--	--	--	--	--
Benin	8	--	--	--	--	--	--
Congo (Kinshasa)	NA	NA	159	130	130	130	130
Egypt	2,240	2,642	2,838	5,600	5,600	5,600	5,600
Kenya	20	20	--	--	--	--	--
Libya	492	909	1,055	1,260	1,300	1,300	1,300
Mauritania	NA	NA	5	5	5	5	5
Morocco	7	7	5	5	5	5	5
Nigeria	220	36	--	40	1,000	2,000	2,400
South Africa	8,620	8,741	8,481	9,493	10,700	11,300	11,700
Tunisia	177	201	237	66	80	200	200
Uganda	--	12	7	7	7	7	7
Zimbabwe	580	210	258	119	100	80	250
Total	13,200	13,600	13,900	17,700	20,600	22,300	24,100

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

NA Not available.

TABLE 12
AFRICA: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country	1990	1995	2000	2005	2007^e	2009^e	2011^e
Algeria	1,100	1,383	818	--	--	--	--
Morocco	68,800	67,708	81,208	42,200	42,000	42,000	42,000
Namibia	18,000	16,084	11,114	14,320	13,400	15,300	--
Nigeria	NA	NA	165	200	100	100	100
South Africa	69,400	88,449	75,262	42,159	42,000	42,000	42,000
Tunisia	2,970	6,601	6,602	8,708	--	--	--
Total	160,000	180,000	175,000	108,000	98,000	99,000	84,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.
NA Not available.

TABLE 13
AFRICA: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country[1]	1990	1995	2000	2005	2007^e	2009^e	2011^e
Algeria	1,000	800	6,100	5,000	--	--	--
Morocco	64,000	59,673	66,812	35,000	35,000	35,000	35,000
Namibia	35,100	26,752	--	--	--	--	--
Total	100,000	87,200	72,900	40,000	35,000	35,000	35,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.
[1] Nigeria also refines a small quantity of primary lead.

TABLE 14
AFRICA: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country[1]	1990	1995	2000	2005	2007^e	2009^e	2011^e
Algeria	3,500	7,500	--	--	--	--	--
Kenya	2,400	2,000	1,000	1,000	1,000	1,000	1,000
Morocco	2,000	2,600	3,000	4,000	4,000	4,000	4,000
Nigeria	--	4,000	5,000	5,000	5,000	5,000	5,000
South Africa	31,200	32,100	46,200	64,000	70,000	70,000	70,000
Total	39,100	48,200	55,200	74,000	80,000	80,000	80,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.
[1] Egypt and Uganda also refine small quantities of secondary lead.

TABLE 15
AFRICA: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1990-2011

(Metal content in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Botswana	23,200	18,088	38,420	39,305	38,000	38,000	25,000
Madagascar	--	--	--	--	--	20,000	60,000
Morocco	NA	NA	84	499	500	500	500
South Africa	29,000	30,700	36,616	42,392	49,000	49,000	76,000
Zambia	--	--	--	--	--	4,000	8,500
Zimbabwe	13,500	11,721	8,160	8,556	9,500	9,000	9,500
Total	65,700	60,500	83,300	90,800	97,000	120,000	180,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production. NA Not available.

TABLE 16
AFRICA: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 1990-2011

(Metal content in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
South Africa	87,800	102,300	114,459	163,711	182,000	190,000	197,000
Zimbabwe	21	7	505	4,834	5,600	8,000	11,000
Total	87,800	102,000	115,000	169,000	187,000	198,000	208,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 17
AFRICA: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 1990-2011

(Metal content in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
South Africa	38,300	51,000	55,818	82,961	94,000	99,000	105,000
Zimbabwe	31	17	366	3,879	4,500	6,500	9,000
Total	38,300	51,000	56,200	86,800	98,500	106,000	114,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 18
AFRICA: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2011

(Metal content in metric tons)

Country[1]	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Algeria	4,160	7,174	10,452	4,463	4,500	3,000	3,000
Congo (Kinshasha)	61,800	4,500	--	15,000	20,000	20,000	20,000
Morocco	18,800	79,947	103,064	77,100	130,000	130,000	130,000
Namibia	37,700	30,209	39,126	68,000	75,000	65,000	--
South Africa	75,000	70,241	63,590	32,112	31,000	31,000	31,000
Tunisia	3,960	44,244	41,247	15,889	--	--	--
Total	201,000	236,000	257,000	213,000	260,000	250,000	185,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Nigeria also mined a small quantity of zinc.

TABLE 19
AFRICA: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2011

(Metric tons)

Country[1]	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Algeria	23,600	30,000	34,000	30,000	30,000	30,000	30,000
Congo (Kinshasha)	38,200	--	--	--	--	--	--
Namibia	--	--	--	120,533	150,000	150,000	150,000
South Africa	92,000	98,782	103,000	102,000	92,000	92,000	92,000
Total	154,000	129,000	137,000	253,000	270,000	270,000	270,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Nigeria also refined a small quantity of zinc.

TABLE 20
AFRICA: HISTORIC AND PROJECTED DIAMOND PRODUCTION, 1990-2011

(Thousand carats)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Angola[1, 2]	1,130	2,900	4,313	7,000	7,900	10,000	10,000
Botswana	17,400	16,802	24,635	31,890	31,000	30,000	33,000
Cameroon	NA	NA	NA	12	12	12	12
Central African Republic	381	530	464	380	400	400	400
Congo (Brazzaville)	NA	NA	50	50	50	50	50
Congo (Kinshasa)	19,400	22,024	16,006	30,300	29,400	31,500	32,200
Côte d'Ivoire	12	75	320	300	300	300	300
Gabon	1	1	1	(3)	(3)	(3)	(3)
Ghana	650	632	878	1,063	1,000	1,000	1,000
Guinea	127	365	327	550	500	500	500
Lesotho	NA	NA	2	37	370	390	390
Liberia	100	150	170	10	10	10	10
Namibia	763	1,382	1,552	1,902	2,100	4,000	9,000
Sierra Leone	78	214	77	669	670	670	670
South Africa	8,710	9,683	10,790	15,776	15,800	16,000	16,000
Tanzania	85	50	354	220	290	1,100	1,110
Zimbabwe	--	204	23	251	230	300	300
Total	48,800	55,000	60,000	90,400	90,000	96,000	105,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to total shown. NA Not available.

-- Negligible or no production.

[1] Does not include smuggled production.

[2] Production was about 90% gem and 10% industrial grade.

[3] Less than 1 unit.

TABLE 21
AFRICA: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2011

(P_2O_5 content in thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Algeria	333	500	265	260	400	350	300
Burkina Faso	NA	NA	NA	1	1	1	1
Egypt	286	207	317	800	800	800	800
Mali	2	1	--	--	--	--	--
Morocco	6,910	6,399	7,200	9,195	9,200	9,500	9,500
Senegal	823	556	626	466	500	500	500
South Africa	1,200	1,101	1,083	1,000	1,000	1,000	1,000
Tanzania	8	2	2	1	1	1	1
Togo	840	930	490	368	400	400	400
Tunisia	1,860	2,181	2,500	2,500	2,400	2,400	2,300
Zimbabwe	52	45	25	14	15	15	25
Total	12,300	11,900	12,500	14,600	14,700	15,000	14,800

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.
NA Not available.

TABLE 22
AFRICA: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Botswana	793	898	947	985	1,000	1,200	5,200
Congo (Kinshasa)	100	10	--	1	1	1	1
Egypt	--	10	39	75	75	75	75
Malawi	41	15	34	49	96	96	96
Morocco	526	650	31	(1)	(1)	(1)	(1)
Mozambique	40	40	16	3	40	40	14,000
Niger	154	135	158	183	180	180	180
Nigeria	78	29	12	9	10	50	50
South Africa	175,000	206,210	224,118	245,007	261,000	270,000	276,000
Swaziland	151	172	178	222	220	220	220
Tanzania	52	43	79	75	110	150	150
Zambia	382	141	168	240	250	250	250
Zimbabwe	5,500	5,538	3,809	2,891	2,500	2,500	4,000
Total	183,000	214,000	230,000	250,000	265,000	275,000	300,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.
[1] Less than 1 unit.

TABLE 23
AFRICA: HISTORIC AND PROJECTED URANIUM MINE PRODUCTION, 1990-2011

(Metal content in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Gabon	702	653	--	--	--	--	--
Malawi	--	--	--	--	--	1,300	1,300
Namibia	3,214	2,006	2,714	3,147	4,500	5,000	5,300
Niger	2,681	2,970	2,898	3,093	3,100	3,100	3,100
South Africa	2,442	1,443	861	674	1,400	2,300	2,500
Total	9,000	7,100	6,500	6,900	9,000	11,700	12,200

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

THE MINERAL INDUSTRY OF ALGERIA

By Philip M. Mobbs

The continued increase of international crude oil and natural gas prices resulted in a significant increase in the value of Algerian exports. In 2005, Algerian exports of goods and services were valued at $48.8 billion,[1] of which hydrocarbons accounted for about $45.6 billion, compared with 2004, when exports of goods and services were about $34.1 billion, of which hydrocarbon exports accounted for about $31.6 billion. In addition to hydrocarbons, which accounted for 76% of Government income and more than 30% of the nation's gross domestic product (GDP), modest volumes of minerals and mineral-based commodities, such as ammonia, clays, cement, gold, helium, iron ore, methanol, phosphate rock, salt, steel, and zinc, also were produced in Algeria. Nonfuel mineral operations fell under law No. 01-10 of July 3, 2001 (The Mining Law), and Decree No. 02-65 of June 2, 2002. In 2005, law No. 05-07 of April 28 (the new hydrocarbon law) was promulgated (Energie & Mines, 2005; Banque d'Algeria, 2006§[2]; Ministère de l'Energie et des Mines, 2006b§).

The International Monetary Fund (2006§) estimated that the Algerian GDP based on purchasing power parity was about $237.7 billion in 2005 and the GDP per capita based on purchasing power parity was $7,189. With an area of about 2.4 million square kilometers, this northern African nation was the second largest country in Africa. Most of the population of Algeria, which was estimated to be about 32.8 million in 2005, lived in the northern coastal region of the country. Most of the rest of the country was covered by the Sahara desert (U.S. Central Intelligence Agency, 2005§; World Bank Group, 2006§).

Trade

Most Algerian exports were shipped through the country's eight main seaports or by pipeline. In 2005, total hydrocarbon exports included crude oil and condensate, which were valued at about $25.6 billion compared with $17.4 billion in 2004; natural gas (by pipeline), about $7.3 billion; liquefied natural gas (LNG), $5.4 billion; refined petroleum products, about $4 billion; and liquefied petroleum gas, $3.3 billion. The value of crude oil exports increased by 47% from 2004 to 2005; by volume, the increase was 7% to about 467 million barrels exported in 2005 compared with about 435 million barrels in 2004. Other mineral commodity exports included phosphate rock, $20.8 million; methanol, $20.3 million; and salt, about $1.2 million (Ministère de l'Énergie et des Mines, 2006b§).

Commodity Review

Metals

Investors were invited to bid on exploration permits by the Ministère de l'Énergie et des Mines (Ministry of Energy and Mines). Permits offered in 2005 included those for the Gara Djebilet and the Mechri Abdelaziz iron ore and the Achab Tiri lead-zinc deposits.

Aluminum.—Dubai Aluminium Co. Ltd. of the United Arab Emirates proposed to build a 600,000-metric-ton-per-year (t/yr)-capacity aluminum products plant in the Bellara Industrial Park in Jijel. Most of the production from the proposed plant would be exported (Ansa Mediterraneo, 2005§).

Gold.—Enterprise d'Exploitation des Mines d'Or s.p.a. mined 65,718 metric tons (t) of ore with an average grade of 11.35 grams per metric ton gold from the Amesmessa, the Tirek, and the Zita area deposits in southern Algeria. Tirek was located about 400 kilometers (km) southwest of Tamanrasset; Amesmessa, 60 km south of Tirek; and the Zita area, between Amesmessa and Tirek. In 2005, a feasibility study for a 300,000-t/yr processing plant at Amesmessa was completed (GMA Resources Plc, 2005, 2006).

In 2005, Sahara Resources Inc., which was a private Canadian company, acquired the four-concession Timgaouine gold property, which is located about 170 km southwest of Tamanrasset. In September, Landmark Minerals Inc., which was a publicly owned Canadian company, announced that it had signed a letter of intent to acquire 70% interest in the Timgaouine property from Sahara Resources.

Lead, Silver, and Zinc.—The Ministère des Ressources en Eau [Ministry of Water Resources] proposed to increase the volume of water pumped from the aquifer at Kherzet Sidi Youcef for local agriculture operations. A side effect of the expected water table drawdown would be the reduction of water influx into the lower levels of the Chabet El Hamra zinc mine.

The joint venture of Maghreb Minerals PLC of the United Kingdom (85% interest) and Gold and Industrial Minerals [GOLDIM] [which was a subsidiary of the Government-owned Office National de la Recherche Géologique et Minière (ORGM) (National Office of Geological and Mining Research) (15%)] acquired the rights to the Tan Chaffao polymetallic project and formed the Tan Chaffao Mining Co. S.A.R.L. In November, Tan Chaffao Mining initiated exploration of the Tan Chaffao deposit, which is located about 250 km northwest of Tamanrasset.

In 2005, the Government again requested bids for rights to develop the zinc resources at Oued Amizour. The development project had been tendered, but not awarded, in 2002.

Mercury.—Mercury production had ended in 2004. In 2005, the Ministère de l'Énergie et des Mines reported that eight flasks of mercury were recovered during the mine site rehabilitation and plant closure operations (Ministère de l'Énergie et des Mines, 2006b§).

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[1] Where necessary, currency values have been converted from Algerian dinars (DA) to U.S. dollars (US$) at the average rate of DA73.44=US$1.00 for 2005 and DA74.15=US$1.00 for 2004.

[2] References that include a section mark (§) are found in the Internet References Cited section.

Industrial Minerals

The Ministère de l'Énergie et des Mines invited bids from investors for development or exploration permits on 77 deposits, which included aggregate, clay, construction sand, diatomaceous earth, dolomite, dimension stone, gypsum, limestone, quartzite and silica sand, salt, and volcanic material. The Enterprise Nationale des Produits Miniers Non-Ferreux et des Substances Utiles, s.p.a. [National Company for Non-ferrous Products] requested bids for the development of bentonite and kaolin deposits and ORGM requested bids for the right to develop a marble deposit.

Cement.—During the construction of the second cement line at its M'Sila facility, Algerian Cement Co. (a subsidiary of Orascom Construction Industries of Egypt) increased the line's capacity to 2.5 million metric tons per year (Mt/yr) from the initial design of 2.2 Mt/yr. Algerian Cement also increased the capacity of its first cement line, which was opened in 2004, to 2.5 Mt/yr from 2.2 Mt/yr. In 2005, Orascom formed Ciment Blanc d'Algerie to manage the construction and eventual operation of a 550,000-t/yr-capacity white cement plant that was to be located 60 km east of Oran. Initial production was expected in 2007. Domestic white cement demand was less than 300,000 t/yr; excess production would be exported (Orascom Construction Industries, 2006, p. 13, 17).

In 2005, the Government offered 35% interest in the state-owned cement plants to investors. Pharaon Commercial Investment Group Ltd. of Saudi Arabia acquired 35% interest in the Beni Saf plant; other international companies entered into negotiations with the Government for interest in several other cement plants.

Mineral Fuels

The new hydrocarbon law changed the procedures required to acquire natural gas and oil exploration and development concessions in Algeria. A tax and royalty system replaced the negotiated production-sharing agreements that companies formerly had signed. The new system included sliding-scale royalty payments that were to be paid monthly; area (land) taxes and taxes on profits, to be paid annually; and an oil income tax, to be paid monthly. The new system also included taxes on flared natural gas and drinking water; a tax on the use, transfer, or assignment of greenhouse gas emission credits; and a 1% tax on the assignment of exploitation or research contract rights. Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures s.p.a. (Sonatrach), which was the Government organization formerly responsible for the hydrocarbon sector, retained the option to acquire a 20% to 30% equity stake in each hydrocarbon project compared with the 50% interest in production-sharing ventures that it formerly was eligible to acquire. For new exploration and development contracts, Sonatrach was tasked to act as a commercial organization. The Agence Nationale pour la Valorisation des Ressources en Hydrocarbures [National Agency for the Development of Hydrocarbon Resources] was formed to negotiate, award, and monitor hydrocarbon exploration and development contracts. The Autorité de Régulation des Hydrocarbures [Hydrocarbon Regulatory Authority] was formed to regulate environmental, health, and safety issues and pipeline operations.

Natural Gas.—An explosion and the subsequent fire that took place on January 19, 2004, had damaged three LNG trains and destroyed another three trains at the Sonatrach LNG facility at Skikda. In mid-2005, the third damaged 1-billion-cubic-meter-per-year-capacity LNG train at Skikda was brought back online. Sonatrach awarded a construction contract for a planned 4.5-billion-cubic-meter-per-year-capacity LNG train that was to replace the destroyed LNG trains. Initial production from the new LNG facility was expected to begin in 2009 (Middle East Economic Digest, 2006a).

Sonatrach continued negotiations with Spanish companies Gas Natural Group and Repsol YPF on an agreement to build a 4-billion-cubic-meter-per-year-capacity LNG train at Arzew as part of the Gassi Touil Integrated Gas Project. Sonatrach also signed a memorandum of understanding with Statoil ASA of Norway for the possible development of a second integrated gas project that would include an LNG plant (Rigzone.com, 2006§).

In late 2005, Sonatrach evaluated technical bids for the development of the hydrocarbon resources in the Tinhert basin. The proposed project would include a 36,000-barrel-per-day-capacity gas-to-liquids plant. Final commercial bids were scheduled to be submitted and evaluated in June 2006 (Middle East Economic Digest, 2005).

The locus of the Algerian natural gas pipeline system was the Hassi R'Mel gasfield. Natural gas from other fields was gathered at Hassi R'Mel and piped to liquefaction facilities at Arzew and Skikda, to Italy through the 974-km-long 27-billion-cubic-meter-per-year-capacity Trans-Mediterranean (also known as the Algeria-Italy, Enrico Mattei, or Transmed) natural gas export pipeline, or to Spain via Morocco through the 1,385-km-long Pedro Duran Farell (also known as the Maghreb-Europe) export pipeline from Algeria. The capacity of the Pedro Duran Farell pipeline was 12 billion cubic meters per year following the installation of the compression station number 3 at El Bayadh in February 2004. Eni S.p.A. and Sonatrach agreed to expand the capacity of the Transmed pipeline to 33.5 billion cubic meters per year by 2012 (Eni S.p.A., 2005; Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures s.p.a., 2005, p. 16).

Proposed new natural gas pipelines included the Gasdótto Algeria-Sardegna-Italy (Galsi), the Medgaz, and the Trans-Sahara pipelines. The 1,470-km-long 10-billion-cubic-meter-per-year-capacity Galsi pipeline would connect the Hassi R'Mel hub with Sardinia and come ashore mainland Italy near Castiglionne della Pescala and Grosseto. The Sardinia regional government would tap up to 2 billion cubic meters per year of natural gas from the Galsi line. In 2005, construction contracts were awarded for segments of the 860-km-long 8-billion-cubic-meter-per-year-capacity Medgaz pipeline that will run from Hassi R'Mel to Almeria, Spain. Initial Medgaz throughput was expected in 2009. Feasibility studies of the between $8 billion and $10 billion 4,300-km-long Trans-Sahara pipeline, which would link the gas production operations of southern Nigeria to coastal Algerian natural gas pipeline terminals at Beni Saf or

El Kala (La Calle), were underway. Initial pipeline operations were projected to begin by 2015 (Middle East Economic Digest, 2006b, c; Petroleum Economist, 2005).

Uranium.—In 2005, Sahara Resources acquired the two-concession Asseo uranium property, which is located about 250 km southeast of Tamanrasset. Landmark Minerals signed a letter of intent to acquire 80% interest in the Asseo property in October, and, on December 21, Landmark announced that it had entered into a strategic alliance with the Government-owned Commissariat à l'Énergie Atomique [Atomic Energy Commission]. On December 28, however, the Government's Agence National du Patrimoine Minier [Mining Estate National Agency] (ANPM) announced that it considered that, based on Landmark's press releases, Sahara Resources had transferred its mining concessions to Landmark without ANPM's approval. ANPM subsequently withdrew all permits that had been granted to Sahara Resources for the six concessions that comprised the Asseo uranium and Timgaouine gold properties. After initial protests failed to reverse the decision, Sahara Resources initiated legal action to regain the permits (Landmark Minerals Inc., 2005a–c, 2006a, b; Ministère de l'Énergie et des Mines, 2006a§, Harmen Keyser, President, Landmark Minerals Inc., written commun., April 9, 2006).

Outlook

Owing to its location close to Europe (which was the major market for its minerals) and its hydrocarbon resources and associated infrastructure, Algeria's hydrocarbon sector is expected to continue to be a magnet for foreign direct investment, although neighboring Libya is expected to siphon off some international oilfield investment interest. The Government proposes to increase oil production (subject to production quotas of the Organization of the Petroleum Exporting Countries) and to increase natural gas exports by 2010. The outcome of the ANPM-Landmark-Sahara concession permit affair could affect international interest in the development of metal deposits.

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TABLE 1
ALGERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2, 3]		2001	2002	2003	2004	2005[p]
METALS						
Cadmium, refined[e]		10	8	5	--	--
Gold	kilograms	300	369	365	597	697
Iron and steel:						
Iron ore, gross weight	thousand metric tons	1,291	1,202	1,378	1,554 [r]	1,579
Metal:						
Pig iron[e]	do.	800 [r]	960 [r]	965 [r, 4]	994 [r, 4]	952 [4]
Steel, crude	do.	947 [r]	1,091	1,051	1,014	1,007
Lead:						
Concentrate, Pb content		891	1,105	--	--	-- [e]
Metal, refined[e]		6,000	6,000	6,100	5,000	5,000
Mercury	kilograms	320,091	307,119	175,600	73,451 [r]	276
Silver[e]	do.	1,700	1,400	500	40 [r]	800
Zinc:						
Concentrate, Zn content		10,693	8,576	2,796	231	4,463
Metal, smelter output[e]		34,000	26,136 [4]	32,200	25,000	30,000
INDUSTRIAL MINERALS						
Barite, crude		43,020	51,773	45,649	47,945	52,813
Cement, hydraulic[e]	thousand metric tons	8,300	9,000	9,000	12,000 [r]	12,800
Clays:						
Bentonite		21,286	27,178	25,346	30,319	29,029
Fuller's earth		3,254	3,521	2,573	2,284	831
Kaolin		13,356	9,505	16,591	24,299	34,386
Diatomite		2,863	3,185	2,595	2,665	1,814
Gypsum[5]	thousand metric tons	281	322	350	1,058 [r]	1,460
Lime, hydraulic[e]		100,000	100,000	100,000	163,000 [r, 4]	163,000
Marble						
Blocks	thousand cubic meters	33	23	24	22	22
Crushed stone		109,872	108,682	105,249	120,666	153,770
Slabs	thousand square meters	224	215	180	99	87
Nitrogen, N content of ammonia[6]		486,500 [r]	563,100	578,200	542,800	550,000 [e]
Phosphate rock:						
Gross weight	thousand metric tons	939	740	905	1,017 [r]	878
P_2O_5 content[e]	do.	280	230	280	300 [r]	260
Pozzolan [e]		421,238 [4]	451,000	500,000	508,000 [r, 4]	494,000
Salt, brine and sea salt		184,682	205,321	191,017	183,000	197,000
Sand	thousand cubic meters	209	392	495	585	503
Sulfur, S content of sulfuric acid[e]		7,200	19,300	20,000	21,000 [r]	22,000
MINERAL FUELS AND RELATED MATERIALS						
Coke	thousand metric tons	441	450 [e]	450 [e]	400	500
Gas, natural:						
Gross	million cubic meters	140,740	139,998	137,634	144,281	151,775
Dry[7]	do.	102,332	101,557	98,754	98,111	98,784
Helium, liquid[e]	do.	16	17	17 [r]	17 [r]	17
Methanol		94,030	91,470	115,690	107,360	94,200
Natural gas plant liquids	thousand 42-gallon barrels	99,800	100,850	98,100	99,380 [r]	99,780

See footnotes at end of table.

TABLE 1--Continued
ALGERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2, 3]		2001	2002	2003	2004	2005[p]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude, including condensate	thousand 42-gallon barrels	464,600	499,890	580,000	589,870 [r]	611,950
Refinery products:						
Liquefied petroleum gas	do.	6,600	6,870	7,050	6,620 [r]	5,780
Gasoline	do.	17,390	16,540	16,150	15,990 [r]	17,560
Naphtha	do.	34,370	33,690	34,230	25,220 [r]	26,440
Kerosene and jet fuel	do.	11,510	10,770	10,170	7,810 [r]	8,480
Distillate fuel oil	do.	49,790	45,100	46,150	42,820 [r]	44,360
Lubricants	do.	790	875	980	1,090 [r]	1,120
Residual fuel oil	do.	42,930	38,850	41,150	37,030 [r]	33,670
Other	do.	2,850	2,690	2,120	1,860 [r]	1,920
Total	do.	166,230	155,385	158,000	138,440 [r]	139,330

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1] Table includes data available through June 12, 2006.

[2] In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities; crude construction materials for local consumption, and copper, fertilizer, marble slabs, methanol, perlite, urea, and volcanic tuff are produced, but available information is inadequate to make estimates of production levels.

[3] In addition to the commodities listed, about 700 metric tons per year (t/yr) of caustic soda is estimated to have been produced.

[4] Reported figure.

[5] Includes about 50,000 t/yr of plaster.

[6] Additional nitrogen was produced by Helios s.p.a., which is a helium liquids production company.

[7] Excludes gas used in flaring, reinjection, transmission losses, and venting.

THE MINERAL INDUSTRY OF ANGOLA

By Omayra Bermúdez-Lugo

The Republic of Angola, which is located in southern Africa, is bordered by the Atlantic Ocean to the west, Namibia to the south, the Democratic Republic of the Congo [Congo (Kinshasa)] to the northeast, and Zambia to the east. In 2005, the population was estimated to be about 11.2 million and was growing at an estimated rate of about 1.9%. The country's total land area is about 1,246,700 square kilometers (km^2) and includes the enclave of Cabinda in Congo (Kinshasa) (U.S. Central Intelligence Agency, 2005§[1]). Angola's estimated gross domestic product (GDP) based on purchasing power parity was about $43.4 billion in 2005, and the per capita GDP based on purchasing power parity was about $2,800 for the same period. Angola's mineral industry was dominated by diamond and petroleum production. Petroleum production alone accounted for about 51.7% of the GDP, 96% of exports, and 80% of Government revenues (International Monetary Fund, 2006§; U.S. Department of State, 2006§).

Government Policies and Programs

In 2005, Angola continued to recover from 27 years of civil war. According to the U.S. Department of State, the Angolan Government estimated that about 4.7 million people were internally displaced by the civil war and that since 2002, about 300,000 of the 450,000 externally displaced had returned to the country. National elections for the presidency and for deputies to the National Assembly were scheduled to be held in September 2006 (U.S. Department of State, 2006§).

The Ministério de Geologia e Minas is the Government entity responsible for the negotiation of mineral rights contracts, for ensuring the application of mining laws, and for conducting geologic surveys. All mineral rights in Angola belong to the State and all mining and prospecting contracts must be approved by the Council of Ministers (The Diamonds and Human Security Project, 2005). Corpo Especial de Fiscalização y Segurança de Diamantes was the Government agency accountable for oversight of the diamond sector; responsibilities included gathering information and tracking exploration, mining, and sales activities of companies in the Angolan diamond industry (The Diamonds and Human Security Project, 2005). Empresa Nacional de Diamantes de Angola E.P. (Endiama), which was the Government-owned diamond company, was responsible for administrating and regulating the diamond sector and was a partner in all diamond ventures. Endiama's subsidiaries included Sociedade de Comercialização de Diamantes de Angola (Sodiam), which was in charge of the marketing, sale, and trade of all diamond produced in Angola and the entity responsible for Kimberley Process compliance; and Endiama Prospeção e Produção S.A.R.L., which oversaw all Endiama's mining and prospecting interests. Sociedade Nacional de Combustíveis de Angola (Sonangol) was the Government-owned company responsible for petroleum exploration and production.

The Government continued with its plan to put an end to informal diamond mining by incorporating artisanal miners into groups that would operate under licenses issued by Endiama. According to the Republic of Angola Embassy in the United Kingdom, about 270,000 foreign nationals involved in illegal diamond mining in the Provinces of Bie, Lunda Norte, Lunda Sul, and Malanje were deported between April 2004 and February 2005. Most of the illegal miners were from Congo (Kinshasa) but also included foreign nationals from other West African countries. The Congolese miners, who had dominated the artisanal sector since the 1990s, had been brought into the country by the National Union for the Total Independence of Angola (UNITA) rebel forces. The Government estimated that an additional 20,000 to 30,000 illegal miners still remained in these areas, in particular in Lunda Norte. Diamond as well as computers, diving suits, electrical pumps, generators, and radios were seized during "Operaçao Brilhante" (the name that was given to the Government operation to deport these miners) (Republic of Angola Embassy in the United Kingdom, 2005a). The areas from which foreign nationals were forced out were being reoccupied by Angolan garimpeiros (the name given to small-scale or artisanal miners). According to The Diamonds and Human Security Project's (DHSP) 2004 annual review on the diamond industry of Angola, nongovernmental organizations had documented death, rape, the forced administration of emetics and laxatives to find diamonds swallowed by miners, forced marches across the border, and the bundling of illegal aliens onto airplanes without their possessions during the execution of Operaçao Brilhante. According to the report, diamond antismuggling initiatives taken by the Government since 2000 have included the training of a specialized diamond squad, gathering intelligence on smuggling rings, and stopping smugglers at the airport. In March 2005, the national police announced that new specialized units were to be created to fight illegal diamond mining (The Diamonds and Human Security Project, 2005, p. 8, 11).

In February 2005, the Government of Angola signed a series of cooperation agreements with China on economic and technical cooperation, energy resources, infrastructure, and minerals. In addition, Sonangol and China Petroleum and Chemical Corporation (Sinopec) signed agreements for the long-term supply of petroleum between the two countries, the joint appraisal of Block 3, and the joint use of Angola's new petroleum refinery. China also granted Angola a $6.3 million interest-free loan (Republic of Angola Embassy in the United Kingdom, 2005e).

In April, the Government announced that many national and foreign investors were interested in developing the country's copper resources from the Mavoio Mines in Uije, in restarting iron ore production from the Cassinga Mines in Huila Province, in developing manganese resources in Kwanza Norte, and in increasing production of granite, marble, and ornamental stones throughout the country (Republic of Angola Embassy in the United Kingdom, 2005j).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

In May, the Government signed a financial agreement for the repayment of a $950 million debt to Brazil. Brazil was to lend another $580 million to Angola for a period of 3 years, which was to be guaranteed by the supply of 20,000 barrels per day of petroleum (bbl/d) to Brazil. The Governments of Angola and Brazil also signed cooperation agreements in the areas of geology and mining (Republic of Angola Embassy in the United Kingdom, 2005l).

Structure of the Mineral Industry

The major foreign companies that operated joint ventures with Endiama in the diamond sector were Almazy Rossii-Sakha Joint Stock Company (ALROSA S.A.) of Russia, BHP Billiton World Exploration Inc., Daumonty Financing Company B.V. of Israel (which is part of the Lev Leviev Group of Israel), the De Beers Group of South Africa, New Millenium Resources N.L., Odebrecht Mining Services Inc. (Odebrecht) of Brazil, Petra Diamonds Ltd. of South Africa, and Trans Hex Group Ltd. of South Africa. The major international companies that operated in the petroleum sector included BP p.l.c., Chevron Corp., Exxon Mobil Corp., Norsk Hydro ASA, and Total S.A.

Trade

According to the U.S. Department of State (2006§), Angola is the second largest trading partner of the United States in sub-Saharan Africa. Angola's exports to the United States were valued at about $8.5 billion in 2005 compared with about $4.5 billion in 2004; of this amount, about $8.2 billion was crude petroleum and about $57.6 million was gem-quality diamond. Imports from the United States were valued at about $928 million in 2005 compared with about $594 million in 2004; these included nearly $611 million in drilling and oilfield equipment (U.S. Census Bureau, 2006a§, b§).

Commodity Review

Metals

Iron and Steel.—In January, the Angolan Government signed a management contract with Chung Fong Holding Company (CFHC) of China to restart production at the National Steelworks factory, which had been idle since 2000. The company began installing equipment at the factory in 2005. The cost of relaunching the country's steel plant was estimated to be $28 million; CFHC's contract was for 15 years. Ownership during the relaunching phase of the project will be CFHC (51%) and the Government (49%) (Republic of Angola Embassy in the United Kingdom, 2005p).

Industrial Minerals

Cement.—Cement in Angola was produced by two companies, Nova Cimangola S.A. (Cimangola) and Companhia de Cimento do Lobito S.A. (Secil-Lobito). The Cimangola cement plant, which was located in Luanda, had an annual production capacity of 700,000 metric tons per year (t/yr) of cement and 540,000 t/yr of clinker and was owned by Cimentos de Portugal, SGPS, S.A. (CIMPOR) (49%), the Government (39.8%), and Banco Africano de Investimentos (9.5%). The Secil-Lobito plant, which was located in the city of Lobito, Benguela Province, had an annual production capacity of 250,000 t/yr of cement and was owned by TecnoSecil Investimentos e Participações SARL of Portugal (TecnoSecil) (51%) and the Government (49%). Cimangola was to invest $200 million for the construction of a new clinker furnace to reduce its dependence on imported clinker. Cimangola's demand for clinker is about 60,000 metric tons per month (t/m). In October 2005, Cimangola commissioned its fifth cement mill. With the commissioning of this new mill, the company expected to increase cement production capacity to about 1.4 million metric tons per year (Mt/yr) in 2006 (Noticias Lusofanas, 2005§).

In 2005, TecnoSecil announced that it planned to invest $80 million for the construction of a new 550,000-t/yr cement plant and clinker furnace at Lobito. The company planned in the long run to further increase capacity to between 1.5 Mt/yr and 2 Mt/yr and to become Angola's leading cement producer (allAfrica.com, 2005§; Embaixada da Republica de Angola em Portugal, 2005§).

Diamond.—According to reports by The Diamonds and Human Security Project (2005, p. 2), only 40% of Angola's estimated diamond resources has been prospected; new prospecting activities were expected to provide a clearer picture of the country's remaining alluvial resources and of the viability of the country's many kimberlite pipes. Alluvial diamond reserves were estimated to be 40 million carats in 2000, although these were also estimated to have decreased significantly in recent years owing to the increase in artisanal mining.

Alluvial and eluvial diamond deposits occur in the Provinces of Cunene, Huambo Bie, Kuando Kubango, Kwanza Sul, Lunda, Malange, Moxico Huila, and Uige. In the northern provinces, diamond deposits extend into Congo (Kinshasa). Other deposits are thought to occur in the coast and offshore, but these areas had not been prospected as of yearend 2005. About 700 kimberlite pipes containing reserves of about 50 million carats are known to exist in the country (The Diamonds and Human Security Project, 2005, p. 2).

Sociedade Mineira de Catoca Ltda. (SMC), which was the country's leading diamond producer, owned Catoca Mine. SMC was a joint venture among Endiama (32.8%), ALROSA (32.8%), Daumonty (18%), and Odebrecht (16.4%). About 3,200 people were employed by SMC, 2,900 of which were Angolan nationals. Reserve estimates at Catoca were reported to be 271 Mt of ore containing about 190 million carats of diamond (Sociedade Mineira de Catoca Ltda., 2005, p. 7-9, 29; Empresa Nacional de Diamantes de Angola, 2006§).

Sociedade de Desenvolvimento Mineiro de Angola S.A.R.L. (SDM) operated the Luzamba project, which is located in the Cuango Valley. The Luzamba project hosted the single largest alluvial operation in Angola; mining operations at Luzamba Mine were expected to last until 2006. SDM, which was a

50-50 joint venture between Endiama and Odebrecht, planned to develop another alluvial deposit at Muanga in southern Cuango Valley and to begin kimberlite prospecting (The Diamonds and Human Security Project, 2005, p. 6).

The Government announced that areas previously occupied by illegal miners were now opened to licensed companies and that, through Endiama, it planned to develop a 7,000-carat-per-year mine in the Camanjanja area in Lunda Norte Province. During the year, Endiama established a partnership with Hong Kong-based China International Fund Limited to prospect for, mine, polish, and market diamond, and to produce jewelry (Republic of Angola Embassy in the United Kingdom, 2005g, h).

In December 2004, Petra Diamonds Limited signed a joint-venture agreement with BHP Billiton World Exploration for the development of the Alto Cuilo diamond project, which is located in northeastern Angola about 700 kilometers (km) southeast of Luanda. In 2005, BHP committed to fund all exploration on the project concession area. During the year, the kimberlite exploration program led to the discovery of four kimberlitic material anomalies; as a result, a second drill rig was mobilized to the area later in the year. The companies planned to continue with their drilling program in 2006. Petra's other interests in Angola included the Medio Kwanza concession, which is located west of Alto Cuilo, and the Muriege concession, which is located east of Alto Cuilo (Petra Diamonds Limited, 2006, p. 5, 12-13).

ALROSA planned to open a diamond treating plant in Luo, Lunda Norte Province. The company was also interested in exploring for other minerals in Angola and was in the process of building a hydroelectric dam, which will be located 20 km from Saurimo (the capital of Lunda Sul Province). The dam was to initially produce electricity to be supplied to the Catoca diamond project (Republic of Angola Embassy in the United Kingdom, 2005n).

On June 17, De Beers and Endiama signed a $10 million diamond prospecting agreement under which De Beers will explore for kimberlites in a 3,000-km^2 area in Lunda Norte. De Beers had a 5-year legal dispute with the Government of Angola over a 1991 diamond contract, which included a $50 million loan to develop mines in the Cuango area. Fifteen months into the contract, the Cuango mines were occupied by UNITA guerrillas and, owing to the absence of a force majeure clause in the contract, interest on the loan remained payable. Under the new agreement, the $50 million repayment was to be transformed into investment in the new project. The new contract stated that a new joint venture was to be formed between De Beers and Endiama for the sale of any discovered diamond. Ownership in the new joint venture was to be Endiama, 51% and De Beers, 49%. The Republic of Angola Embassy in the United Kingdom reported that the agreement marked the end of another dispute between De Beers and the Government, which began in 2000 after the Government suspended contracts for the sale or purchase of diamond as part of the restructuring of the sector and the subsequent establishment of Sodiam as the sole authority to market diamond in the country (Republic of Angola Embassy in the United Kingdom, 2005f; The Diamonds and Human Security Project, 2005, p. 7).

SouthernEra Diamonds Inc. (18%) of Canada in joint venture with Minex Lda. (38%), Endiama (37%), and S.A.R.L. Comica (7%) were given Government approval to form a company under the name of Camafuca Sociedade Mineira Lda. The newly formed company was granted a mining license to develop the primary kimberlite deposits associated with the country's Camafuca-Camazambo kimberlite pipes. The deposits are located in the Lunda Norte Province in northwestern Angola about 20 km southeast of the town of Lucapa. SouthernEra estimated total inferred mineral resources to be about 210 million cubic meters at an average grade of 0.111 carat per cubic meter containing about 23 million carats of diamond (SouthernEra Diamonds Inc., 2006, p. 2-3, 18).

Trans Hex held a 35% interest in Luarica Mine and a 32% interest in Fucauma Mine, which are located in northeastern Angola. Luarica Mine, which began production in 2003, produced 96,000 carats of diamond in 2005. The company planned to upgrade the plant at Luarica and to increase production capacity to 14,000 carats per month by 2006 at a cost of $6 million. The Fucauma Mine began operating in August 2005 and produced a total of 83,000 carats during the year. The Fucauma plant had a diamond production capacity of 120,000 carats per year. Trans Hex also held interest in the Gango and the Luana exploration concessions. Gango was at an early exploration stage with bulk sampling of the kimberlite expected by the third quarter of 2005. At Luana, dredge sampling was completed in 2004, and evaluation bulk sampling was expected by the third quarter of 2005 (Trans Hex Group Ltd., 2006, p. 13, 16).

Angola Resources Pty. Ltd. (a subsidiary of New Millenium Resources Ltd.) reported that production had begun at its Rio Lapi Garimpo alluvial mine in April 2005. New Millenium held a 34% interest in the Rio Lapi mine in joint venture with Endiama (51%), and Mombo Lda. (15%). No diamond production figures were reported during the year. The mine was expected to produce about 10,000 carats per month during the first 5 months of operation; production was then to be increased to about 20,000 carats per month. The expected life of the mine was 6.5 years. New Millenium was in negotiations with the Government to also acquire a kimberlite asset in Angola. The company held an exploration license for the C9 kimberlite concession (New Millenium Resources Ltd., 2006, p. 5-7; The Diamonds and Human Security Project, 2005, p. 7).

In December, Namakwa Diamond Company NL of Australia signed a memorandum of understanding with Angolan-based Tecmad-Mining Services SARL (Tecmad) for the exclusive right to evaluate and present a development and operating plan to mine the Camutue associated diamond deposits in Lunda Norte Province. The Camutue associated deposits are located about 10 km east of the town of Lucapa. Tecmad was entitled to a 60% interest in the profits of the operations of the concession under a consortium agreement with Endiama. The Camutue concession included a kimberlite cluster of at least nine kimberlite pipes, two of which had been mined in the past; these kimberlite pipes were not included in the operating agreement. Upon demonstrating technical capabilities through the mining of the associated deposits, Namakwa will have the opportunity to negotiate an agreement to explore and acquire an interest in the kimberlite cluster. According to company reports, the Camutue kimberlite pipes were discovered in 1958 and were mined by open pit methods from 1961 to 1974. During this period, about 3.8 million metric tons (Mt) of ore was processed and about 333,700 carats was recovered (Namakwa Diamond Company NL, 2005).

Angola inaugurated its first diamond cutting and polishing factory in 2005. The Angola Polishing Diamond SA factory was a joint venture among Sodiam (48%), Lev Leviev Diamonds (LLD) (47%), and Projem, a local consortium (5%). The factory had a processing capacity of $30 million worth of diamond and will employ about 600 people, 40 of which will be diamond cutters. The diamond cutters were being trained in Namibia and were afterwards to train the factory's future diamond cutters, which Endiama reported will be hired among Angola's mutilated and disabled citizens. The factory was built in 10 months at a cost of $10 million (Endiama Hoje, 2005, p. 11; UN Office for the Coordination of Humanitarian Affairs, 2005§).

Granite.—The Government estimated that the number of companies involved in the extraction of industrial minerals in the Huila Province had increased to 17 in 2005 from 4 in 2001. The Huila Province produced more than 500 cubic meters per day of black granite. Granite exports alone generated about $4 million. Granite was exported to Canada, Japan, Panama, Portugal, South Africa, and Spain (Republic of Angola Embassy in the United Kingdom, 2005c).

Other.—Mayfair Mining and Minerals Inc. (70%) in joint venture with Bepigma Lda, a private Angolan company, was granted a license to develop the Ucua pegmatite complex in Bengo Province. The license covers an area of 1,369 km^2. Mayfair will prospect the area for beryl-related minerals, including aquamarine, alexandrite, emerald, and chrysoberyl. The company reported that the area is also prospective for beryllium, columbium (niobium), copper, and zinc. The terms of the agreement with Bepigma included a 2-year work program and an investment of up to $2.25 million during 3 years (Mayfair Mining & Minerals Inc., 2005).

Mineral Fuels

Petroleum and Natural Gas.—Petroleum is produced offshore the enclave of Cabinda, offshore in the Kwanza Basin north of Luanda, offshore the country's northern coast, and onshore around the city of Soyo. According to Sonangol, more than 200 exploration and appraisal wells have been drilled in Angola since 1990 (Sonangol E.P., 2005§). Deepwater exploration began in 1991 with the leasing of Block 16, followed by the leases of Blocks 14, 15, 17, 18, and 20. As of the beginning of 2000, a total of 29 offshore and onshore blocks had been licensed to 30 companies; the first floating production, storage, and offloading rig came online in August 2004.

The U.S. Energy Information Administration (2006§), estimated that proven petroleum reserves in Angola, which was sub-Saharan Africa's second ranked petroleum producer after Nigeria, have tripled since 1999 to an estimated 5.4 billion barrels. Daily production was expected to increase to 2 million barrels per day (Mbbl/d) by 2008 from 1.25 Mbbl/d in 2005 owing to the expected coming onstream of new offshore production from deepwater Blocks 14, 15, 17, and 18. Most of Angola's petroleum was exported to the United States and China; on average, only 60,000 bbl/d were consumed domestically in 2005 (The Angola LNG Project, 2006§; U.S. Energy Information Administration, 2006§).

In November 2004, China Sonangol International Holding (CSIH), a Hong Kong-based subsidiary of Sonangol, signed a letter of intent with Government-owned Energía Argentina S.A. (Enarsa) for the investment of $5 billion for 5 years to cooperate on offshore prospecting and exploration in Argentina. CSIH and Enarsa discussed the possibility of establishing a partnership to develop petroleum resources in other countries (not specified) as well as to jointly develop any concessions that Enarsa could acquire in the future. No further developments concerning the status of prospecting and exploration activities were reported in 2005 (Movimiento por la Recuperacion de la Energia Nacional Orientadora, 2004§; Voice of America, 2005§).

In January, Chevron, through its subsidiary Cabinda Gulf Oil Company Ltd. (CGO), announced the beginning of petroleum production from the Bomboco field. The Bomboco field, which is located on Block 0 offshore Malongo, Cabinda Province, was expected to reach an average production of 30,000 bbl/d. The first condensate (light oil) from Bomboco was processed at the company's Sanha processing facilities. The facilities, which are located about 37 km offshore and directly above the Sanha oilfield, served as a hub for the processing of natural gas from surrounding oilfields, crude petroleum, condensate (light petroleum), and liquefied petroleum gas (a mixture of butane and propane). The combined production from the Sanha facilities, which included production from the Bomboco field was expected to reach an estimated 100,000 bbl/d by 2007. Block 0 was operated by Chevron (39.2%) and the remaining partners in the joint venture were Sonangol (41%), Total (10%), and Eni Angola Exploration B.V. (9.8%) (ChevronTexaco Corp., 2005b, c).

In March, Angola's Council of Ministers passed a draft resolution on tax incentives for the second phase of the Angola LNG Project (ALNGP), which is to be built in Soyo, Zaire Province, in the northern part of the country. The project is expected to cost about $4 billion (Republic of Angola Embassy in the United Kingdom, 2005k).

Sonangol and BP announced their sixth petroleum discovery on Block 31. The oilfield, named Ceres 1, follows the discovery of Plutao, Saturno, Marte, Venus, and Palas. The partners in the block were BP (26.67%), Esso Exploration and Production Angola (25%), Sonangol (20%), Statoil Angola (13.33%), Marathon Petroleum Angola (10%), and Tepa Limited (5%). BP expected Blocks 18 and 31 to begin new production in 2007 and 2009. With the addition in production of these two blocks to the already producing Blocks 15 and 17, the company expected to produce about 400,000 bbl/d by 2010 (Republic of Angola Embassy in the United Kingdom, 2005d, o).

In June, a new deepwater petroleum discovery was made in Block 32. During a test phase, the well, named Gengibre 1, produced 4,724 bbl/d of petroleum. The partners in the block were Marathon Oil Company (30%), Total E & P Angola (30%), Sonangol (20%), Esso Exploration and Production Angola (15%), and Petrogal (5%) (Republic of Angola Embassy in the United Kingdom, 2005q).

Proven natural gas reserves in Angola have been estimated to be 45.3 billion cubic meters (reported as 1.6 trillion cubic feet). About 85% of the natural gas produced in the country was flared and the remainder was reinjected to help in the recovery of petroleum or processed to produce liquefied petroleum gas. To reduce the flaring of natural gas, the Government (22.8%), in joint venture with Chevron (36.4%), BP (13.6%), ExxonMobil (13.6%), and Total (13.6%), planned to convert the associated natural gas from the production of petroleum in Blocks 0, 15, 17, 18, and future ultra deep water blocks to liquefied natural gas (LNG) for export. Under the ALNGP, as the project is known, the Government and its joint-venture partners planned to transport natural gas via pipeline to an LNG plant onshore for conditioning and extraction of natural gas liquids before converting to LNG (ChevronTexaco Corp., 2005a, d; The Angola LNG Project, 2006§; U.S. Energy Information Administration, 2006§).

Infrastructure

In 2005, the Government approved a $190 million program for the rehabilitation of the country's main highways, which was aimed at repairing about 1,200 km of road by 2006 (Republic of Angola Embassy in the United Kingdom, 2005r, p. 2).

Plans to rehabilitate the Benguela railway were underway in 2005. The railway, which runs from the Atlantic coast to Angola's eastern border, was expected to be fully rehabilitated by August 2007 at a cost $330.5 million. The tender for the project was granted to China International Fund Limited. About 50 trains per day were expected to transit through the railway and would have the capacity to carry about 4 million passengers and 20 million metric tons per day of goods. The rehabilitation of the Mocamedes railway was also underway and scheduled to be completed by August 2007 at a cost of $1.2 billion. The Moçamedes railway runs from Namibe on Angola's southeastern Atlantic coast, through Lubango and Matala in Huila Province, to Menongue in the southeastern part of the country (Republic of Angola Embassy in the United Kingdom, 2005b). In March, railway equipment worth $17 million was to be supplied by India. The Government of Angola signed five agreements with India on the training of railway personnel, operations material, company management, the supply of equipment, and the rehabilitation of workshops for the Mocamedes project (Republic of Angola Embassy in the United Kingdom, 2005e, i).

On November 8, a new hydroelectric dam (the Capanda dam) was inaugurated in Malanje Province. The dam was built at a cost of $2.6 million and was to provide electricity for 6 million people in the Provinces of Bengo, Kwanza Norte, Kwanza Sul, Luanda, and Malanje. The final phase of the project was to be completed in the second half of 2007. Upon completion, the dam will produce about 520 megawatts (Republic of Angola Embassy in the United Kingdom, 2005m).

Outlook

National reconciliation, reintegration, and reconstruction of the country after more than 25 years of civil war were finally underway in 2005. Economic prosperity in Angola is likely to rely greatly on the development of the country's two most important mineral resources—diamond and petroleum. Interest in assessing the country's undeveloped mineral resources, such as copper, gemstones, iron, and platinum group metals, has begun to develop among foreign companies. The Government is taking steps to continue with the restructuring of the diamond sector. The creation of Sodiam; plans to incorporate artisanal diamond miners into groups that would operate under Government-issued licenses; the deportation of foreign nationals engaged in illegal diamond mining; the expansion of the formal sector by granting foreign companies the right to prospect, explore, and develop mining projects in joint venture with Endiama; and the establishment of the country's first diamond cutting and polishing factory suggest that, in the long run, the country is likely to develop a competitive diamond industry in the region. Although in the short run, most diamond production will come from alluvial deposits, in the longer run, most production will come from the mining of kimberlite pipes.

The petroleum sector, however, will continue to be the dominant sector in both the short and the long runs. Angola's economy is likely to continue to depend greatly on petroleum production in particular given the significant number of petroleum discoveries made in the past few years, which have tripled proven reserves to an estimated 5.4 billion barrels. Angola is likely to remain sub-Saharan Africa's second ranked petroleum producer and one of the 10 leading suppliers of crude petroleum to the United States. With production expected to increase to 2 Mbbl/d by 2008, the petroleum sector is likely to continue to be the main contributor to the national economy in the near future. Reconstruction efforts, which include the rehabilitation of roads and bridges, the refurbishing of railways, and the construction of powerplants, also add to the country's ability to reinforce infrastructure that will support future mining activities and attract foreign direct investment. The signing of cooperation agreements in geology and mining with such countries as Brazil and China, the return of De Beers as a diamond prospector in the country, the relaunching of the country's steel production plant, and plans to increase cement production capacity at the country's two cement plants also suggest the Government's commitment to further develop Angola's mineral industry. The large number of landmines that remain in the country will, however, continue to limit geologic fieldwork in some localities.

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TABLE 1
ANGOLA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		2001	2002	2003	2004	2005
INDUSTRIAL MINERALS						
Cement:[e]						
Hydraulic	thousand metric tons	550 [2]	597 [2]	700	740	800
Clinker	do.	480 [2]	452 [2]	480	480	500
Diamond[3, 4]	thousand carats	5,159	5,022	5,700	6,100	7,000
Granite[e]	thousand cubic meters	1,500	1,500	1,500	1,500	1,500
Marble[e]	do.	100	100	100	100	100
Salt[e]	metric tons	30,000	30,000	30,000	30,000	30,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum:[e]						
Crude	thousand 42-gallon barrels	270,100	329,600	321,200	383,250 [r, 2]	456,250 [2]
Refinery products[5]	do.	14,000	14,000	14,000	14,000	14,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised.

[1] Table icludes data available through November 2, 2006.

[2] Reported figure.

[3] Does not include smuggled production.

[4] Production was approximately 90% gem and 10% industrial grade.

[5] Includes asphalt and bitumen.

TABLE 2
ANGOLA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Nova Cimangola S.A.(Cimentos de Portugal SPGS S.A., 49%; Government, 39.8%; Banco Africano de Investimentos, 9.5%)	Luanda	700,000; 540,000 clinker.
Do.		Companhia de Cimento do Lobito (TecnoSecil Investimentos e Participações SARL, 51%, and Government, 49%)	City of Lobito, Benguela Province	250,000.
Diamond	thousand carats	Sociedade Mineira de Catoca Ltda. (Endiama EP., 32.8%; ALROSA S.A., 32.8%; Daumonty Financing Company B.V., 18%; Odebrecht Mining Services Inc., 16.4%)	Catoca Mine, Lunda Sul Province, 36 kilometers south of Saurimo	6,500.
Do.	do.	Endiama EP., 51%; New Millenium Resources Ltd., 34%; Mombo Lda., 15%	Rio Lapi Mine, 45 kilometers northeast of Saurimo, Lunda Sul Province	240.
Do.	do.	Trans Hex Group Ltd., 35%, and Endiama EP., 40%	Fucauma Mine, northeastern Angola	120.
Do.	do.	Trans Hex Group Ltd., 32%, and Endiama EP., 40%	Luarica Mine, northeastern Angola	NA.
Do.	do.	Sociedade de Desenvolvimento Mineiro de Angola S.A.R.L. (Government, 50%, and Odebrecht Mining Services Inc., 50%)	Luzamba alluvial mine, Cuango Valley	NA.
Steel		Chung Fong Holding Company, 51%, and Government, 49%	Relaunching of steel plant. Under development	NA.

NA Not available.

THE MINERAL INDUSTRIES OF BENIN, BURKINA FASO, AND SAO TOME E PRINCIPE

By Omayra Bermúdez-Lugo

BENIN

Benin is a West African country bounded by Togo to the west, Burkina Faso and Niger to the north, Nigeria to the east, and the Bight of Benin to the south. In 2005, Benin's mineral industry was a minor component of the national economy; production of mineral commodities was limited to cement, clay, gold, and sand and gravel. Cement was produced by Ciments du Benin S.A., Société des Ciments du Benin, and Société des Ciments d'Onigbolo. These companies had a combined cement production capacity of 925,000 metric tons per year (t/yr) (table 2).

Gold was produced by artisanal miners from gold veins near the villages of Kwatena and Tchantangou, in the Atakora Mountains in northwestern Benin, and from alluvial sediments along the Perma River and its tributaries. Benin ceased producing petroleum from its Seme oilfield in 1998; however, at least four petroleum companies were engaged in exploration activities within the country in 2005. One of these companies was Korea National Oil Corporation (KNOC), which held an 80% interest in two petroleum exploration blocks offshore Benin. In October 2005, KNOC contracted The Peak Group of the United Kingdom to conduct a drilling program for Block 2. Block 2 is located about 24 kilometers offshore Benin. Drilling operations began in October (Korea National Oil Corporation, 2006, p. 29, 44-45; Rigzone.com, 2006§[1]).

Another company exploring for petroleum in Benin was Kosmos Energy LLC of the United States. In 2005, Kosmos, through its subsidiary Kosmos Energy Benin HC, acquired a 40% working interest in an exploration license for Block 4 offshore Benin in the Gulf of Guinea. Kosmos venture partners were Kerr-McGee Benin Consortium S.A. (an affiliate of Kerr-McGee Corporation) (40%) and Petronas Carigali Overseas Sdn Bhd (20%). Kerr-McGee was the operator (Kosmos Energy LLC, 2005).

More-extensive coverage of the mineral industry of Benin can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the Internet at URL http://minerals.usgs.gov/minerals/pubs/country.

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BURKINA FASO

Burkina Faso is a landlocked West African country bordered by Benin to the southeast, Côte d'Ivoire, Ghana, and Togo to the south, Mali to the north, and Niger to the northwest. In 2005, Burkina Faso's mineral industry was a minor component of the national economy; production of mineral commodities was limited to cement, dolomite, gold, granite, marble, phosphate rock, pumice and related volcanic materials, and salt. Canadian companies Axmin Inc., Channel Resources Ltd., Etruscan Resources Inc., Goldcrest Resources Ltd., High River Gold Mines Ltd., Jilbey Gold Exploration Ltd., Orezone Resources Inc., Riverstone Resources Inc., Semafo Inc., and St. Jude Gold Resources Ltd. continued with gold exploration activities within the country throughout the year. Randgold Resources Ltd. of the United Kingdom also explored for gold.

In September, Axmin sold its 100% interest in the Boroum permit to a subsidiary of High River at a cost of $3.3 million (Axmin Inc., 2006, p. 23). Channel Resources continued with exploration activities at its Bombore and Tanlouka gold properties (Channel Resources Ltd., 2006, p. 3, 8). Etruscan Resources began mine development at its 90% owned Youga gold property, which included the upgrading of a 30-kilometer main access road from the town of Zabre to the mine site. Construction work was expected to be completed in early 2007 and the estimated mine output was expected to be about 2,700 kilograms per year (kg/yr) of gold. The company planned to undertake an additional drilling program on the permits surrounding the Youga mining permit in 2006 (Etruscan Resources Inc., 2006, p. 1).

High River continued with construction of the open pit mine and mill facilities at its Taparko-Boroum property. The company expected to complete construction work by the end of 2006 with commissioning set for early 2007. In September, High River announced the completion of its merger with Jilbey Gold (High River Gold Mines Ltd, 2005; 2006, p. 8, 10).

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[1] References that include a section mark (§) are found in the Internet Reference Cited sections.

More-extensive coverage of the mineral industry of Burkina Faso can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the Internet at URL http://minerals.usgs.gov/minerals/pubs/country.

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SAO TOME E PRINCIPE

The Democratic Republic of Sao Tome e Principe consists of the two islands of Sao Tome and Principe and several islets in the Gulf of Guinea. The islands of Sao Tome e Principe are located in the equatorial Atlantic about 300 km and 250 km, respectively, off the northwestern coast of Gabon. Mining did not play a significant role in Sao Tome e Principe's economy. Mineral production was limited to some clay and volcanic rock; potential exists, however, for the development of the country's petroleum industry. All other mineral product requirements were imported.

The Joint Development Zone (JDZ), which is an overlapping maritime boundary between Nigeria and Sao Tome e Principe, was divided into nine blocks in 2003, and a licensing round was opened for bids in 2004. Nigeria (60%) and Sao Tome e Principe (40%) jointly operate the JDZ. In May 2005, ERHC Energy Inc. (ERHC) (formerly known as Environmental Remediation Holding Corporation; the name was changed in February 2005) was awarded exploration rights within the JDZ for Blocks 2, 3, 4, 5, and 6 (ERHC Energy Inc., 2005§). In February 2005, ChevronTexaco JDZ announced that it had signed a production-sharing agreement for Block 1, which had been awarded in April 2004 by the Nigeria-Sao Tome e Principe Joint Development Authority. ChevronTexaco JDZ was a joint venture of ChevronTexaco Corp. of the United States (51%), Esso Exploration and Production Nigeria-Sao Tome "One" Ltd. (40%), and Dangote Energy Equity Resources Ltd. (9%), which was in turn a joint venture of the Dangote Group of Nigeria and Energy Equity Resources AS of Norway (ChevronTexaco Corp., 2005).

More-extensive coverage of the mineral industry of Sao Tome e Principe can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the Internet at URL http://minerals.usgs.gov/minerals/pubs/country.

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TABLE 1
BENIN AND BURKINA FASO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003	2004[e]	2005[e]
BENIN						
Cement, hydraulic		250,000	250,000	250,000	250,000	250,000
Clay[e]		17,716 [3]	19,000	21,000	21,000	21,000
Gold	kilograms	16	20 [e]	20	20	20
Gravel	cubic meters	24,675	26,000 [e]	28,500	29,000	29,000
BURKINA FASO[2]						
Cement[e]		50,000	30,000 [e]	30,000	30,000	30,000
Dolomite[e]	cubic meters	3,000	3,000	3,000	3,000	3,000
Gold	kilograms	229	209	770	1,125 [3]	1,397 [3]
Granite[e]	cubic meters	280,000	300,000	300,000	300,000	300,000
Phosphate rock:						
Gross weight		1,010	2,350	2,400 [e]	2,400	2,400
P_2O_5 content		280	650	650 [e]	650	650
Pumice and related volcanic materials[e]		10,000	10,000	10,000	10,000	10,000
Salt[e]		5,000	5,000	5,000	5,000	5,000
Stone, marble[e]		100,000	100,000	100,000	100,000	100,000

[e] Estimated; estimated data are rounded to no more than three significant digits.

[1] Table includes data available through May 22, 2006.

[2] In addition to the commodities listed, sand and gravel and other construction materials are produced, but information is inadequate to make reliable estimates of output.

[3] Reported figure.

TABLE 2
BENIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Société des Ciments d'Onigbolo (Amida Group, 100%)	Onigbolo plant	450,000 cement; 500,000 clinker.
Do.	Ciments du Benin S.A. (Scancem International of Norway, 48.7%)	Cotonou plant	275,000 cement.
Do.	Société des Ciments du Benin (Government, 50%, and private, 50%)	do.	200,000 cement.

THE MINERAL INDUSTRY OF BOTSWANA

By Philip M. Mobbs

The mineral sector again dominated Botswana's economy, as it has for the past 15 years. Diamond has been the leading component of the mineral sector since large-scale diamond production began 25 years ago. Most of Botswana's diamond production was of gem quality, which resulted in the country's position as the world's leading producer of diamond by value. Copper, gold, nickel, and soda ash production also has held traditionally significant, though smaller, roles in the national economy. In 2005, mining accounted for about 38% of Botswana's real gross domestic product (GDP), and more than 50% of Government revenues were derived from mining and mineral-processing activity. In 2005, the nominal value of minerals produced in Botswana exceeded that of 2004 by about 20% in terms of the United States (U.S.) dollar. Much of the increase was attributed to higher international mineral prices. Diamond, copper-nickel matte, and gold, in order of value, accounted for most of the increase (Bank of Botswana, 2006, p. S-8, S-90, S-103; Olson, 2006; E. Mkandawire, Department of Mines, August 29, 2006, written commun.).

Botswana's GDP based on purchasing power parity was estimated to be about $18.1 billion[1] in 2005 with an estimated real growth rate of 6.2% and an inflation rate of 8.6%. The per capita GDP based on purchasing power parity was estimated to be $11,410. The per capita GDP level was one of the highest in Africa and placed Botswana in the category of upper-middle-income countries (International Monetary Fund, 2006§[2]).

Trade

Botswana encompasses an area of 600,379 square kilometers in southern Africa and is bordered by Namibia, South Africa, and Zimbabwe. Most merchandise trade was shipped via rail or truck through South Africa. According to the Bank of Botswana (2006, p. S-88–S-90), the total value of exports in 2005 was about $4.66 billion. Mineral exports, of which diamond accounted for $3.3 billion; copper and nickel matte, about $461 million; soda ash, about $65 million; and gold, about $36 million, represented 83% of total merchandise exports. The provisional value of imports in 2005 was $3.28 billion.

Commodity Review

Metals

Copper and Nickel.—In eastern Botswana, about 200 kilometers (km) south of Francistown, the smelter operated by BCL Ltd. of Botswana processed copper-nickel concentrate from the company's Selebi-Phikwe Mine. Under an agreement signed in 2001 by Centametall AG of Switzerland and Falconbridge International Ltd. of Barbados, BCL also toll-smelted concentrate from the Phoenix open pit mine, which was operated by Tati Nickel Mining Co. (a subsidiary of LionOre Mining International Ltd. of Canada). During 2005, the BCL smelter produced 68,637 metric tons (t) of nickel-copper-cobalt matte. Centametall and Falconbridge shipped the nickel matte to the Falconbridge Nikkelverk, AS refinery in Norway and RioZim Ltd.'s Eiffel Flats refinery in Zimbabwe (Department of Mines, 2006, p. 6).

In 2002, BCL and Falconbridge agreed to extend to 2015 the tolling agreement under which BCL-mined nickel matte was refined in Norway. The reserves at the Selebi-Phikwe Mine, however, were expected to be exhausted by 2011 or 2012. In 2005, the Government continued to evaluate proposals to sustain the town of Selebi-Phikwe after the closure of the mine and to minimize the potential negative impact of the closure on operations of the BCL smelter, the Botswana Power Corp., the Botswana Railways, and the Morupule Colliery. The BCL operation accounted for about 60% of Botswana's industrial sector's total energy consumption (Fagbenle, 2000§).

The output of copper-nickel matte from the BCL smelter traditionally has exceeded the smelter's 40,000-metric-ton-per-year (t/yr) design capacity, often by more than 30% (table 1). Despite the adverse effect of cyclical metals prices during the past two decades and the looming closure of the Selebi-Phikwe Mine, the design capacity of BCL smelter recently was expanded to 60,000 t/yr. In 2005, matte output exceeded the smelter's new design capacity. Because the BCL smelter might shut down with the closure of the Selebi-Phikwe Mine, LionOre had initiated in 2003 a pilot plant project to evaluate the recovery of copper and nickel from the Phoenix Mine by using Western Minerals Technology Pty. Ltd.'s Activox® process. In 2005, a feasibility study of an Activox® plant with an output capacity of 25,000 t/yr of nickel was underway. The study was expected to be completed in mid-2006 (LionOre Mining International Ltd., 2006, p. 12; Malema and Legg, 2006, p. 215).

Several copper and nickel exploration projects were underway. African Copper plc continued its evaluation of the Dukwe copper project, which was located about 130 km northwest of Francistown, and the adjacent Matsitama licenses. African Copper successfully completed a feasibility study of an open pit, heap leach, and solvent extraction/electrowinning operation to process the oxidized ore at Dukwe and started a feasibility study of the underground development of the sulfide zone at Dukwe. African Copper proposed to begin a 10,000-meter infill drill program at Matsitama in 2006.

In 2005, Discovery Nickel Ltd. continued its exploration drilling on the Northeast Botswana Brownfields nickel project, which included the Dikoloti, the Dikoloti North, the Kima, and the Lentswe prospects. In 2005, Discovery Nickel acquired seven prospecting licenses in northwest Botswana that formed the Maun copper project.

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[1] Where necessary, values have been converted from the Botswana pula (BWP) to U.S. dollars at the rate of BWP5.06=US$1.00 for 2005 and BWP4.66=US$1.00 for 2004.

[2] References that include a section mark (§) are found in the Internet References Cited section.

Tau Mining Botswana (Pty.) Ltd. [a subsidiary of African Platinum plc (Afplats) of the United Kingdom] completed a preliminary evaluation of its Molopo Farms prospect, which was located about 175 km west of Gaborone. Because of higher priority projects in southern Africa, Afplats decided to divest its interest in the Molopo Farms prospect.

WMC Resources Exploration Pty. Ltd. of Australia was acquired by the BHP Billiton Group in 2005. The WMC/BHP Billiton joint venture with Albidon Ltd. of Australia conducted airborne and ground electromagnetic surveys, mapping, and soil sampling on its Selebi-Phikwe nickel project. Activity on the Tati nickel project, which was a joint venture of Albidon and Gallery Gold Ltd. of Australia, included the completion of a reconnaissance drilling program on the Kismet and the Tekwane nickel prospects.

Gold.—Mupane Gold (a subsidiary of Gallery Gold) operated the Mupane Mine, which was located about 30 km southwest of Francistown. In 2005, ore was sourced from the oxide and transition zones of the Tau open pit and, after mid-year, the oxide zone of the Tholo pit. At the Mupane plant, Mupane Gold commissioned a ball mill, installed a flotation plant to handle sulfide and transition zone gold ore, and upgraded the oxygen plant. Gallery Gold continued exploration of other gold occurrences near the Mupane facility; these included the Jim's Luck prospect; the Maitengwe lease; the Golden Eagle, the Lady Mary 2, and the Map Nora prospects on the Sashe license; the Ratomo and the Signal Hill prospects in the Tati Belt; and the Vumba lease. At yearend IAMGOLD Corp. of Canada proposed to acquire Gallery Gold and Gallery Gold's Botswana operations.

Industrial Minerals

Diamond.—Debswana (a 50-50 joint partnership of De Beers Centenary AG and the Government) accounted for all diamond production in Botswana from its four mines. Debswana continued its recovery from the labor unrest that had resulted in a 2-week strike in 2004. In 2005, Debswana treated about 31.2 million metric tons (Mt) of ore to yield 31.89 million carats, which was an increase of more than 2% compared with carat production in 2004. Debswana's diamond production included 14.890 million carats from the 34-year-old Orapa Mine, which was a 7% decline compared with 2004; 15.6 million carats from the 23-year-old Jwaneng Mine, which was a 14% increase compared with 2004; 1.097 million carats from the 20-year-old Letlhakane Mine, which was a 6% increase compared with 2004; and 246,278 carats from the 2-year-old Damtshaa Mine, which was a 27% decline from that of 2004. The production decline at Orapa was attributed to the loss of a haul road because of a ramp failure and a fire, which destroyed a loading shovel (Debswana Diamond Co. (Pty.) Ltd., 2006, p. 12-16).

De Beers and the Government agreed that some of De Beer's Diamond Trading Company's operations would move from London, United Kingdom, to Gaborone, Botswana. Local marketing of domestically produced gemstones was expected to help the local diamond cutting and polishing companies.

Numerous other companies were exploring for diamond in Botswana. Active exploration operations included those of Boteti Exploration (Pty.) Ltd., which was a joint venture between De Beers (51%) and African Diamonds plc (49%); Gcwihaba Resources (Pty.) Ltd. (a subsidiary of Tsodilo Resources Ltd.); Helio Resources Corp.; Newdico (Pty.) Ltd., which was a joint venture of Tsodilo (81%) and the Trans Hex Group (19%); Tawana Resources N.L.; and the joint ventures of De Beers and Firestone Diamonds plc; Motapa Diamonds Inc. and Stornoway Diamond Corp.; and Rio Tinto Mining and Exploration Ltd. and Trivalence Mining Corp. In addition, DiamonEx Ltd. of Australia started a reevaluation of the Martin's Drift prospect, which was a 5-kimberlite deposit that had been trial mined by Tswapong Mining Co. from 1997 to 2001, and Petra Diamonds Ltd. of the Channel Islands acquired Kalahari Diamond Ltd. and its Botswana-based subsidiary Sekaka Diamonds (Pty.) Ltd.

Mineral Fuels

Coal.—Debswana operated the Morupule Colliery at Palapye, which is located about 175 km south of Francistown. Much of the company's coal production was sold to the adjacent Morupule Power Station (MPS) of Botswana Power Corp. (BPC). Record coal sales in 2005 were 967,242 t, which was an 8% increase compared with the total in 2004. A coal washing plant was under construction (Debswana Diamond Co. (Pty.) Ltd., 2006, p. 17).

In 2005, Coal Investment Corp. (CIC) of the British Virgin Islands and Meepong Investments (Pty.) Ltd. of Botswana entered into a joint venture to reevaluate the Mmamabula coal project. Mmamabula previously had been explored extensively by a number of organizations, which included AMAX Exploration Inc. of the United States, Anglo American Corp. of South Africa, the coal division of British Petroleum Ltd. of the United Kingdom, Charbonnages de France International Botswana, the Geological Survey of the Bechuanaland Protectorate, the Geological Survey of Botwsana, and Shell Coal Botswana Ltd. Mmamabula's inland location and lack of process water had thwarted the prospect's development as a coal export project in the early 1980s. In 2005, CIC's local subsidiary, Meepong Resources (Pty) Ltd., proceeded with a feasibility study of the Mmamabula license, and the U.S. Trade and Development Agency awarded a contract to Delphos International, Ltd. of the United States to provide financial advisory assistance to the Botswana Ministry of Minerals, Energy, and Water Resources for the development of a 1,200-megawatt coal-fired powerplant at Mmamabula (Connor, 1983; U.S. Trade and Development Agency, 2005§).

Outlook

International interest in exploration for diamond and base and precious metals is expected to continue. The country's favorable geologic environment, mineral investment climate, low tax rates, and political stability are expected to continue to make Botswana a foreign mineral investment magnet. The Government encourages mineral value-added processing, but the paucity of water in landlocked Botswana has deterred large-scale industrial development. The country's small domestic market, the cost of transportation to ports in South Africa, and the rampant Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) epidemic also limit the nation's attractiveness to investment by foreign manufacturers. High fuel costs would continue to affect the cost of transportation of Botswana's imports and exports adversely.

Revenues from diamond operations are expected to continue to be the mainstay of the country's economy for the foreseeable future, although Debswana has scheduled lower production volumes. Copper, gold, nickel, and soda ash production and processing also are expected to continue to be notable factors in the country's economy.

Given the country's extensive coal resources and projected regional power demand, Botswana has the potential to develop and support a small-scale coal-bed methane industry and additional coal-fueled electricity-generating plants that could supply power to the South African Power Pool through its land lines to South Africa.

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Major Sources of Information

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TABLE 1

BOTSWANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005[p]
Coal, bituminous		930,374	953,081	822,780	913,087 [r]	984,876
Cobalt, smelter output, Co content of matte[3, 4]		325	269	294	223	326
Copper:						
Mine output, Cu content of ore milled		26,700 [e]	27,750	31,380	29,460	31,300 [e]
Smelter output, matte, gross weight[3]		50,999	56,625	51,983	54,448	68,637
Smelter output, Cu content of matte[3, 4]		19,209	21,590	24,292	21,195	26,704
Diamond[5]	thousand carats	26,416	28,397	30,412	31,125	31,890
Gemstones, semiprecious[6]	kilograms	76,000	127,000	102,000	99,000	165,000
Gold[7]	do.	2	8	9	161 [r]	2,709
Nickel:						
Mine output, Ni content of ore milled		26,700 [e]	28,600 [e]	38,230	35,163 [r]	39,305
Smelter output, matte, gross weight[3]		50,999	56,625	51,983	54,448	68,637
Smelter output, Ni content of matte[4]		22,454	23,896	27,400	22,292	28,212
Salt[8]		178,646	315,259	229,432	208,319	243,945
Sand and gravel[9]	thousand cubic meters	207	2,401	1,485	2,330	2,110
Soda ash, natural		251,231	283,197	309,350	263,358	279,085
Stone, crushed	thousand cubic meters	2,141	1,201	1,060	1,219	1,100

[e] Estimated; estimated data are rounded to no more than three significant digits. [p] Preliminary. [r] Revised.

[1] Table includes data available through October 31, 2006.

[2] In addition to commodities listed, platinum, palladium, and silver were produced and exported in the nickel-copper-cobalt matte; copper and nickel cathodes also were produced at a pilot plant, but information is inadequate to estimate output.

[3] Smelter product was granulated nickel-copper-cobalt matte.

[4] Includes some product from direct smelting ore; that is, ore not reported as milled.

[5] Assumed to contain about 70% gem and near gem.

[6] Principally agate. Reported as sales.

[7] Reported as bullion; historically included silver estimated to be about 2%.

[8] Byproduct of natural soda ash production.

[9] Includes clay (for brick and tile).

THE MINERAL INDUSTRY OF BURUNDI

By Thomas R. Yager

Burundi, which is a small country in central Africa, was a producer of columbium (niobium) and tantalum ore, gold, tin ore, and tungsten ore, most of which, in 2005, was designated for export (table 1). The country also produced limestone, peat, and sand and gravel for domestic consumption. Additionally, Burundi has resources of cobalt, copper, feldspar, nickel, phosphate rock, platinum-group metals (PGM), quartzite, rare-earth elements, uranium, and vanadium. In 2005, manufacturing accounted for 8% of Burundi's gross domestic product; construction, 5%; and mining and energy, 1% (International Monetary Fund, 2006, p. 80).

In April 2005, Argosy Minerals Inc. of Australia withdrew the force majeure that it imposed at the Musongati nickel deposit in August 2004 because of political instability. Argosy resumed work on Musongati because of improvements in the security situation and the decision of the transitional Government to hold elections in 2005. The company was carrying out a feasibility study for an open pit mine at Musongati that would produce 45,000 metric tons per year (t/yr) of nickel, 7,500 t/yr of cobalt, and 2,500 t/yr of copper. Argosy also held the rights to the Nyabikere and the Waga nickel deposits (Mining Communication Ltd., 2005; Mining Review Africa, 2005).

Deposits of columbium (niobium) and tantalum were mined by Asyst Mines, Comptoirs Miniers de Burundi S.A., Hamza, and Habonimana. Production of columbite-tantalite ore and concentrate had decreased to 23,356 kilograms (kg) in 2004 from 24,382 kg in 2003 and 72,441 kg in 2002 because of low world market prices for tantalum oxide. In 2005, production increased to 42,592 kg; columbite-tantalite accounted for 5% of the value of Burundi's mineral production (Mining Communication Ltd., 2005; Damien Riragonya, Director General of Geology and Mines, Burundi Ministry of Energy and Mines, written commun., June 26, 2006).

National gold production increased to 3,905 kg in 2005 from 3,229 kg in 2004 and 415 kg in 2001 because of higher gold prices. Gold accounted for more than 90% of the reported value of Burundi's mineral production in 2005. Machanga Ltd. of Uganda was reported to be Burundi's leading producer of gold. Burundi Mining Corp. held the mining title to most of the country's primary gold occurrences, which were concentrated in Muyinga Province in northeastern Burundi (Mining Communication Ltd., 2005; Damien Riragonya, Director General of Geology and Mines, Burundi Ministry of Energy and Mines, written commun., June 26, 2006).

Artisanal miners mined small amounts of tin and tungsten. In 2005, tungsten production amounted to 94 metric tons (t), and tin, 4 t. Tin and tungsten accounted for 3% of the reported value of Burundi's mineral production (Damien Riragonya, Director General of Geology and Mines, Burundi Ministry of Energy and Mines, written commun., June 26, 2006).

The state-owned Office National de la Tourbe produced and distributed peat for domestic consumption. Resources of peat were estimated to be 36 million metric tons, most of which was located in the Akanyara Valley near Buyongwe (table 3).

Burundi has no identified resources of coal, natural gas, or petroleum. The country does not have a refinery for petroleum products; all petroleum demand was met through imports. Burundi's production of electricity decreased to 99.2 gigawatthours (GWh) in 2005 from 113.9 GWh in 2001. During the same period, imports increased to 71.2 GWh from 40.8 GWh, and consumption decreased to 119.8 GWh from 122.1 GWh. Hydroelectric power stations accounted for most of the country's electricity production (International Monetary Fund, 2006, p. 90).

Outlook

The outlook for columbium (niobium) and tantalum, gold, nickel, and tin depends heavily upon global market conditions and the resolution of political instability. Burundi's domestic market is limited by severe poverty. In spite of improvements in the security situation, conflict continued between the Government and the Forces Nationales de Liberation in the western part of the country in 2005. Demand for such local construction materials as clays, sand and gravel, and stone could increase because of reconstruction from the civil war (United Nations Integrated Regional Information Networks, 2005).

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TABLE 1
BURUNDI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
Columbium (niobium) and tantalum, ore and concentrate:						
Gross weight	kilograms	122,537	72,441	24,382	23,356	42,592
Nb content	do.	NA	NA	4,300	4,598 r	8,384
Ta content	do.	32,230	14,500	5,769	5,038 r	9,188
Gold, mine output, Au content	do.	415	483	2,855	3,229 r	3,905
Peat		6,816	6,977	4,580	4,643	4,700 e
Tin, mine output, Sn content		3	--	5	9 r	4
Tungsten, mine output, W content		--	--	13	8 r	94

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. NA Not available. -- Zero.

[1] Table includes data available through June 27, 2006.

TABLE 2
BURUNDI: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Burundi Cement Plant[1]	Bujumbura	20,000.
Columbium (niobium) and tantalum		Asyst Mines, Comptoirs Miniers de Burundi S.A., Hamza, and Habonimana	Kayanza and Kirundo Provinces	NA.
Gold		Machanga Ltd.	NA	NA.
Do.		Burundi Mining Corp.	Masaka	18,300 ore processing.
Do.	kilograms	do.	do.	33 gold.
Peat		Office National de la Tourbe	Highland Bogs	20,000.
Tin		Artisanal miners	Murehe	NA.
Tungsten		do.	do.	NA.

NA Not available.

[1] Has not operated since 1996.

TABLE 3
BURUNDI: MINERAL RESOURCES IN 2005[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Cobalt, copper, and nickel	Musongati	185 Mt	1.31% Ni; 0.08% Co; 0.17% Cu	2.4 Mt Ni; 150,000 t Co; 310,000 t Cu.
Do.	Nyabikere	46 Mt	1.45% Ni; 0.031% Co; 0.012% Cu	670,000 t Ni; 14,000 t Co; 5,500 t Cu.
Do.	Waga	35 Mt	1.38% Ni; 0.048% Co; 0.028% Cu	480,000 t Ni; 17,000 t Co; 9,800 t Cu.
Gold	Masaka	8 Mt	1.8 g/t	14 t.
Do.	Other deposits in Muyinga Province	NA	NA	45 t
Kaolin	Vyerwa	16 Mt	NA	NA.
Do.	Matongo	2.7 Mt	NA	NA.
Limestone	do.	1 Mt	NA	NA.
Peat	Akanyuru Valley	NA	NA	36 Mt.

NA Not available.

[1] Abbreviations used in this table for commodities include the following: Co--cobalt; Cu--copper; and Ni--nickel. Abbreviations used in this table for units of measure include the following: g/t--grams per metric ton; Mt--million metric tons; and t--metric tons.

Sources: Burundi Ministry of Energy and Mines, 1991; Burundi mineral resources—An investment brochure: Bujumbura, Burundi, Burundi Ministry of Mines and Energy, 41 p.

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THE MINERAL INDUSTRIES OF CAMEROON AND CAPE VERDE

By Omayra Bermúdez-Lugo

CAMEROON

Cameroon is a West African country that borders the innermost bay of the Gulf of Guinea between Equatorial Guinea and Nigeria. The petroleum sector was the most significant segment of Cameroon's mineral industry. Other mineral commodities produced in the country were cement, clay, limestone, marble, pozzolana, primary aluminum, and sand, and modest amounts of diamond and gold in placer deposits. A variety of industrial minerals and other construction materials, such as aggregates, gypsum, and stone, are also produced. Cameroon's undeveloped mineral resources include bauxite, cobalt, diamond, gold in lode deposits, granite, iron ore, nepheline syenite, nickel, and rutile.

The Ministère des Mines de l'Eau et de l'Energie was responsible for the administration of the mineral industry in accordance with the Mining Law of 2001 and the Petroleum Code of 2000. Compagnie Camérounaise de l'Aluminium (Alucam), which was owned by Alcan Inc. of Canada and the Government of Cameroon (46.7% each) operated a primary aluminum smelter and a rolling mill at Edea. In 2005, Alcan signed a Letter of Intent with the Government of Cameroon to increase its primary aluminum smelter capacity to 260,000 metric tons per year (t/yr) from its actual capacity of 90,000 t/yr and to construct a new hydroelectric powerplant. The estimated cost of the project, which was scheduled to be completed by 2010, was $900 million (Alcan Inc., 2005; Republic of Cameroon Prime Minister's Office, 2005§[1]). Cimenteries du Cameroun operated two cement plants. Numerous local operations produced industrial minerals. State-owned Société Nationale des Hydrocarbures (SNH) was involved in hydrocarbon exploration and production with various joint-venture partners, including Addax Petroleum Cameroon Ltd., Amerada Hess Corp., ChevronTexaco Corp., Exxon Mobil Corp., Fusion Oil and Gas NL, Petronas Carigali Overseas Sdh. Bhd., Total S.A., and Tullow Oil plc.

Small-scale artisanal miners recovered gold in the eastern and northern parts of the country. Annual gold production was estimated to be about 1,500 kilograms. Diamond was also produced throughout the country by small-scale artisanal miners. The country's petroleum reserves were located offshore in the Rio del Rey Basin, offshore and onshore in the Douala and Kribi-Camp Basins, and onshore in the Logone-Birni Basin in the northern part of the country. Cameroon's only refinery, which is located in the port city of Limbe, was operated by Société Nationale de Raffinage.

More-extensive coverage of the mineral industry of Cameroon can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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Republic of Cameroon Prime Minister's Office, 2005, Aluminum upgrade under study between ALCAN and Cameroon, accessed April 14, 2006, at URL http://www.spm.gov.cm/detail_art.php?id_art=859&type=simpl&lang=en.

CAPE VERDE

Cape Verde is an archipelago of 10 islands and 8 islets located about 600 kilometers off the western coast of Africa. Mining plays a minor role in the country's economy. Production of mineral commodities is limited to the production of clay on the islands of Boa Vista, Sal, and Sao Vicente; gypsum on the island of Maio; limestone on the islands of Boa Vista, Sal, and Santo Antao; pozzolana on the island of Santo Antao; and salt on the islands of Mindelo and Sal. Cape Verde is not a petroleum producer.

More-extensive coverage of the mineral industry of Cape Verde can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
CAMEROON AND CAPE VERDE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005[e]
CAMEROON						
Aluminum metal, primary		80,900 [3]	67,000	77,200	85,900 [3]	90,400 [3]
Cement, hydraulic		980,433 [r, 4]	936,969 [r, 4]	948,943 [r, 4]	1,032,438 [r, 4]	1,000,000
Clay		22,580 [r, 4]	23,066 [r, 4]	24,881 [r, 4]	25,000 [e, r]	25,000
Diamond	carats	4,800 [r, 4]	5,000 [r, 4]	5,500 [r, 4]	12,000	12,000
Gold, mine output, Au content[5]	kilograms	600 [r, 4]	700 [r, 4]	700 [r, 4]	1,500	1,500
Petroleum:						
Crude	thousand 42-gallon barrels	29,200	26,280 [3]	24,820 [3]	34,675 [3]	21,900 [6]
Refinery products	do.	12,000	12,000	12,000	12,000	12,000
Pozzolana, ash for cement		600,000	620,000	600,000	600,000	600,000
Sand and gravel		456,810	556,382	601,201	601,000	601,000
Sapphire	kilograms	1,000 [4]	1,000 [4]	1,000 [4]	1,000	1,000
Silica sand		11,165 [4]	12,408 [4]	13,927 [4]	14,000	14,000
Stone:						
Limestone		92,558 [r, 4]	98,600 [r, 4]	103,420 [r, 4]	103,000 [r]	103,000
Marble		420 [r, 4]	445 [r, 4]	468 [r, 4]	500 [e, r]	500
CAPE VERDE[7]						
Salt[e]		1,600	1,600	1,600	1,600	1,600

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised.

[1] Table uncludes data available through March 6, 2006.

[2] In addition to the commodities listed, a variety of industrial minerals and construction materials (aggregate, gypsum, and stone) are produced, and bauxite may be produced, but information is inadequate to make reliable estimates of output. The National Institute of Statistics of Cameroon reports salt production to be less than 1 metric ton per year.

[3] Reported figure.

[4] Reported by the National Institute of Statistics of Cameroon.

[5] From artisanal mining.

[6] Reported by the U.S. Energy Information Administration.

[7] Cape Verde also presumably produced clay, gypsum, limestone, and pozzolana, but output is not reported, and available information is inadequate to make estimates of output.

THE MINERAL INDUSTRIES OF CENTRAL AFRICAN REPUBLIC, CÔTE D'IVOIRE, AND TOGO

By Omayra Bermúdez-Lugo

CENTRAL AFRICAN REPUBLIC

Central African Republic produced diamond, gold, and small amounts of kaolin and quartz crystals. Identified mineral occurrences in the country included copper, graphite, ilmenite, iron ore, kyanite, lignite, limestone, manganese, monazite, rutile, salt, tin, and uranium. In 2005, diamond production was estimated to be about 380,000 carats compared to an estimated 350,000 carats in 2004 (table 1). Diamond was produced from alluvial deposits in the northern part of the country. Gold was produced by artisanal miners from the Bandas and the Bogoin-Boali greenstone belts.

Canadian companies Energem Resources Inc. and Vaaldiam Resources Ltd. continued to explore for diamond during 2005. Energem focused on the development of suitable prospects within its Bangana, Bria, Kotto, and Quadda Ouadda concession areas and Vaaldiam was in the process of completing a geologic survey for its Haute Kotto alluvial diamond mining area, which was located in the southeastern part of the country. Vaaldiam's survey included reconnaissance sampling of alluvial gravels. The company's plan to explore for diamond-bearing kimberlite pipes in the country continued to be on hold during the year as the company focused on other priority exploration areas in Brazil (Energem Resources Inc., 2005; Vaaldiam Resources Ltd., 2005, p. 11).

During the third quarter of 2005, Axmin Inc. of Canada reported the results of an updated mineral resource estimate for the Passendro gold project. The resource estimate was prepared by SRK Consulting of the United Kingdom. SRK reported indicated gold resources to be about 13.2 million metric tons (Mt) of ore at a grade of 2.5 grams per metric ton (g/t) gold, and inferred gold resources of 19.3 Mt of ore at a grade of 1.8 g/t gold. A prefeasibility study for the Passendro project was underway as of yearend. The prefeasibility study was to be conducted by GBM Ltd., a division of Grantham Industries Ltd. of the United Kingdom (Axmin Inc., 2005§[1]).

In October, African-based Pan African Resources plc announced that it had entered into a joint-venture agreement with Goldiam SARL and International Mining Investments Ltd. to explore for gold. The joint venture's exploration activities were to be managed by Pangea Exploration Pty Ltd. International Mining and Pan African will each hold a 45% interest in the joint venture; Goldiam will hold the remaining 10% interest. In November 2005, Pan African announced the results of the first phase of regional geochemical sampling for the Bogoin project, which identified a regional gold geochemical anomaly, and announced the beginning of the second phase of the exploration program, which focused on infill geochemical line sampling (Pan African Resources plc, 2005a, b).

Central African Republic did not produce mineral fuels in 2005 and depended upon imports for its energy requirements.

More-extensive coverage of the mineral industry of Central African Republic can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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Pan African Resources plc, 2005a, Pan African acquires an interest in JV in the Central African Republic: London, United Kingdom, Pan African Resources plc press release, October 5, 2 p.

Pan African Resources plc, 2005b, Project update—Bogoin project, Central African Republic: London, United Kingdom, Pan African Resources plc press release, November 10, 1 p.

Vaaldiam Resources Ltd., 2005, Management discussion and analysis for the nine months ended September 30, 2005: Toronto, Ontario, Canada, Vaaldiam Resources Ltd., 19 p.

Internet Reference Cited

Axmin Inc., 2005, Third quarter report for the nine months ended September 30, 2005, accessed May 3, 2006, at URL http://www.axmininc.com/pdfs/AXM-2005Q3-Interim-Report.pdf.

CÔTE D'IVOIRE

Côte d'Ivoire produced cement, clay, columbium (niobium), diamond, gold, gravel and crushed rock, manganese, natural gas, crude petroleum and petroleum products, sand, sulfuric acid, and tantalum. The country also had deposits of bauxite, cobalt, copper, iron ore, nickel, and silica sand.

In 2005, gold production increased to 1,638 kilograms (kg) from 1,219 kg in 2004 (table 1). Equigold NL of Australia through its subsidiary Equigold Côte d'Ivoire S.A. held a 94% interest in five gold exploration permits. The permits were for the Bassawa, the Didievi, the Kokoumbo, the Oume, and the Timbe properties, which are located within the country's Oume-Fetekro Proterozoic greenstone belt. In 2005, the company acquired exploration licenses for the Hire, the Sassandra North, and the Sassandra South gold properties and applied for licenses for the San Pedro East, the Tehini East, and the Tehini West gold properties. The company's exploration efforts during the year focused on the Bonikro deposit, which was located on the Oume property. In 2005, the company reported a revised resource estimate for Bonikro of about 25 Mt of ore at a grade of 1.7 g/t gold and a cutoff grade of 0.6 g/t gold. Equigold planned to complete a bankable feasibility study for Bonikro by June 2006 (Equigold NL, 2006, p. 12-14).

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[1] References that include a section mark (§) are found in the Internet Reference(s) Cited sections.

Randgold Resources Ltd.'s exploration activities in Côte d'Ivoire continued to be on hold throughout the year, according to the company, owing to the country's political instability (Randgold Resources Ltd., 2006a§, b§).

Etruscan Resources Inc. of Canada held an exploration permit for the Agbaou gold deposit, which is located about 200 kilometers northwest of the Port of Abidjan. During 2005, the company completed a 5,230-meter drilling program at Agbaou and planned to conduct further drilling during the second quarter of 2006 (Etruscan Resources Inc., 2006, p. 2).

In 2005, Cluff Gold plc of the United Kingdom hired SRK Consulting to review drill data for the Mt. Yaoure gold property that had been purchased from Cominor S.A. [a subsidiary of Cie. Générale Des Matieres Nucleaires Group (COGEMA)]. The data included drill assay results that identified satellite gold deposits in the vicinity of the now closed Angovia gold mine. The Angovia Mine lies within the Mt. Yaoure exploration permit. Upon validation of the drill data, SRK derived a mineral resource estimate of about 3.1 Mt of ore at an average grade of 1.9 g/t gold. Cluff planned to acquire an oxide processing plant onsite from the Government and to continue with exploration (Cluff Gold plc., 2006, p. 6).

More-extensive coverage of the mineral industry of Côte d'Ivoire can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

References Cited

Cluff Gold plc., 2006, 2005 annual report: London, United Kingdom, Cluff Gold plc., 36 p.

Equigold NL, 2006, 2005 annual report: Applecross, Western Australia, Equigold NL, 60 p.

Etruscan Resources Inc., 2006, 2005 annual report: Windsor, Nova Scotia, Canada, Etruscan Resources Inc., 36 p.

Internet References Cited

Randgold Resources Ltd., 2006a, 2005 annual report, accessed June 14, 2006, at URL http://www.randgold.com/randgold/applications/randgold/templates/annual_report_2005/index.htm.

Randgold Resources Ltd., 2006b, Tongon project, accessed May 4, 2006, at URL http://www.randgoldresources.com/randgold/view/randgold/en/page379.

TOGO

Togo produced cement, clinker, diamond, gold, limestone, and phosphate rock. The country also had resources of bauxite, gypsum, iron ore, manganese, marble, rutile, and zinc. The Ministère des Mines, de l'Énergie et des Postes et Télécommunications was responsible for the administration of the mining sector. Togo's production of phosphate rock decreased to 1.021 Mt in 2005 from 1.115 Mt in 2004 (table 1). The International Fertilizer Group Togo, which was a 50-50 joint venture between the Government of Togo and Brifco Ltd. of France, was the company in charge of phosphate production.

More-extensive coverage of the mineral industry of Togo can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

TABLE 1

CENTRAL AFRICAN REPUBLIC, CÔTE D'IVOIRE, AND TOGO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005[e]
CENTRAL AFRICAN REPUBLIC[2]						
Diamond	carats	452,700	416,400	332,700 [3]	350,000	380,000
Gold	kilograms	34	16	7 [3]	7	7
CÔTE D'IVOIRE[4]						
Cement[e]		650,000	650,000	650,000	650,000	650,000
Columbite[e]	kilograms	130	130	130	130	130
Diamond	carats	309,000	306,500	230,000	300,000 [r]	300,000
Gold	kilograms	3,672	3,570	1,313 [3]	1,219 [3]	1,638 [3]
Gravel and crushed rock		550,000 [e]	550,000 [e]	600,412 [r, 3]	659,097 [r, 3]	660,000
Natural gas	million cubic meters	1,062	1,610	1,457 [3]	2,000 [r, 3]	2,200 [3]
Petroleum:						
Crude	thousand 42-gallon barrels	2,099	5,457 [r]	7,506 [r, 3]	8,125 [r, 3]	14,574 [3]
Refinery products[e]	do.	19,500	19,000	19,000	19,000	19,000
Sand[e]		750,000	750,000	233,737 [r, 3]	173,056 [r, 3]	173,000
Sulfuric acid		3,000	3,000	3,000	3,000	3,000
Tantalite[e]	kilograms	400	400	400	400	400
TOGO[5]						
Cement:[e]						
Clinker		1,000,000	1,000,000	1,200,000	1,200,000	1,200,000
Hydraulic[6]		800,000	800,000	800,000	800,000	800,000
Diamond	carats	NA	NA	87,200	123,100	41,000
Limestone[e]		2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Phosphate rock, beneficiated product:						
Gross weight	thousand metric tons	1,067	1,271	1,471 [3]	1,115 [3]	1,021 [3]
P_2O_5 content[e]	do.	380	460	530	418 [3]	368

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. NA Not available.

[1] Table includes data available through April 2006.

[2] In addition to the commodities listed, Central African Republic produced kaolin and quartz crystals, but information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] In addition to the commodities listed, Côte d'Ivoire produced clay, crushed granite, manganese, and stone, but information is inadequate to make reliable estimates of output.

[5] Togo also presumably produced gold, but output is not reported, and available information is inadequate to make reliable estimates of output.

[6] Includes cement produced from imported clinker.

TABLE 2
CÔTE D'IVOIRE AND TOGO: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
CÔTE D'IVOIRE				
Cement		Société des Ciments d'Abidjan	Abidjan plant	750,000.
Do.		Société Ivorienne de Ciment et Materiaux (Holcim Ltd.)	do.	500,000.
Do.		Société des Ciments du Sud-Ouest	San Pedro	100,000.
Gold		Société des Mines d'Ity (Cie. Générale des Matieres Nucleaires Group, 51%, and Société pour le Développement Minier en Côte d'Ivoire, 49%)	Ity Mine	450,000 ore.
Do.	kilograms	do.	do.	2,250 gold.
Do.	do.	do.	do.	1,200 gold.
Petroleum, crude	thousand 42-gallon barrels	Canadian Natural Resources Ltd., 57.61%; Svenska Petroleum, 27.39%; Société Nationale d'Operations Pétrolières de la Côte d'Ivoire, 15%	Baobab oilfield	17,520.
Do.	do.	Canadian Natural Resources Ltd., 58.67%; Tullow Oil plc, 21.33%; Société Nationale d'Operations Pétrolières de la Côte d'Ivoire, 20%	East Espoir oilfield	6,700.
Do.	do.	do.	Lion and Panther oilfields	2,000.
Petroleum products	do.	Société Ivorienne de Raffinage	Abidjan	23,800.
TOGO				
Cement		Ciments du Togo	Lome plant	800,000 cement.
Do.		West African Cement Company	Tabligbo	1,000,000 cement; 1,200,000 clinker.
Limestone		Ciments de l'Afrique de l'Ouest	do.	2,400,000.
Phosphate rock		International Fertilizer Group Togo	Akoumape and Hahotue	2,000,000.

THE MINERAL INDUSTRY OF CHAD

By Philip M. Mobbs

In 2005, Chad's gross domestic product (GDP) at current prices was estimated to have increased to about $5.43 billion.[1] The real GDP increased at an annual rate of 5.6% compared with 30.7% in 2004, which was the first full year of oil production. The International Monetary Fund (2006§[2]) reported that Chad's GDP based on purchasing power parity was more than $13.7 billion in 2005 and that the GDP per capita based on purchasing power parity was $1,519. The impact of the mineral sector on employment was minimal; subsistence agriculture employed about 80% of the total population, which was estimated to be more than 9.9 million in 2005.

Landlocked Chad was the fifth largest country in Africa with an area of 1,284,999 square kilometers. Crude oil was exported via the Chad-Cameroon pipeline to an export terminal at Kribi, Cameroon. Agricultural products (primarily livestock) were moved across the borders into neighboring central African countries (Cameroon, the Central African Republic, Nigeria, and Sudan); additional informal cross-border trade with Libya and Niger was also conducted. Most formal international trade with Chad was funneled through seaports in Cameroon and Nigeria.

Structure of the Mineral Industry

In Chad, the Ministère du Plan, du Développement et de la Coopération; the Ministère des Mines et de l'Énergie; and the Ministère du Pétrole were responsible for developing policy that affected various sectors of the mineral industry. The Direction de la Recherche Géologique et Minière organized mineral sector investigations, and the Direction du Pétrole was responsible for the administration of the petroleum sector.

Since the initiation of petroleum exports from Chad in 2003, oil has overshadowed the limited suite of other produced mineral commodities, which included aggregates, clay, gold, lime, limestone, natron (soda ash), salt, sand, and stone. Most of these solid minerals were produced by small-scale local miners. Independent and major international oil companies were involved in the exploration for and production of crude oil. Esso Exploration and Production Chad, Inc. (Esso Chad) and Tchad Oil Transportation Co. S.A. operated about 200 kilometers (km) of the 1,070-km Chad-Cameroon crude oil pipeline that was located in Chad.

Government Policies and Programs

The President of Chad was in the final year of his second term of office. In June 2005, Chad's Constitution was amended to eliminate the two-term limit for the Presidency.

On December 29, 2005, the National Assembly passed amendments to the Petroleum Revenue Management law (PRML) (law 001PR/99 dated January 11, 1999, as amended by law 016/PR/2000 dated August 1, 2000). The amendments extended the coverage of the PRML beyond the initial three oilfields (the Bolobo, the Kome, and the Miandoum Fields) developed by Esso Chad to include all producing oilfields in Chad. The amendments eliminated the Future Generation Fund, which previously had received 10% of direct oil revenues (which included dividends and royalties). The amendments added additional priority sectors (the energy and oil sector, and the justice, security, and territorial administration sector) to the original priority sector list, which included the education, the environment and water resources, the health and social services, the infrastructure, and the rural development sectors; and reduced the direct oil revenues dedicated to the expanded group of priority sectors to 63% of dividends and 58.5% of royalties. Previously, the original priority sectors were allocated 72% of direct oil revenues. The amendments also allocated 27% of direct oil revenues to the Government's general budget for the remaining life of the crude oil production compared with 13.5% through December 2007 under the original PRML.

The loan agreement for the Chad-Cameroon oil export pipeline between the Government of Chad and the World Bank stated that the Government was not to amend the PRML in such a way as to adversely affect the revenue stream to the original priority sectors. The World Bank objected to the new amendments, which were promulgated in January 2006, and subsequently suspended disbursements of funds to Chad on January 6, 2006 (Blustein, 2005; World Bank Group, 2006§).

Commodity Review

Mineral Fuels

Petroleum.—Esso Chad, which was a joint venture of Exxon Mobil Corp. of the United States (40% equity interest), Petronas Carigali Overseas Sdn. Bhd. of Malaysia (35%), and Chevron Overseas Petroleum Inc. of the United States (25%), operated the Bolobo, the Kome, the Miandoum, and the Nya Fields. The four-well Nya Field began production in mid-2005.

Esso Chad drilled an additional 75 infill wells in the Bolobo, the Kome, and the Miandoum Fields owing to unanticipated reservoir conditions. Several additional water injector wells also were drilled for the disposal of the higher-than-expected water content in the produced oil. Development of the 25-well Moundouli Field continued in 2005; initial production was expected in early 2006. In 2005, Esso Chad's successful exploration drilling program in the Maikeri-Poutouguem area lead the company to apply for the rights to develop an oilfield on the prospect (Esso Exploration and Production Chad, Inc., 2006, p. 9-14).

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[1] Where necessary, values have been converted from Communauté Financière Africaine francs (XAF) to U.S. dollars (US$) at the average rate of XAF532.7=US$1.00 for 2005 and XAF534.4=US$1.00 for 2004. The implied purchasing power parity conversion rate was XAF204.927=US$1.00 for 2005.

[2] References that include a section mark (§) are found in the Internet References Cited section.

In 2005, EnCana Corp. of Canada, which controlled 50% interest in the Permit H concession, bought seismic data that had previously been acquired on the concession and, in October, began its own seismic surveys. In 2006, EnCana planned additional two-dimensional and three-dimensional seismic surveys and proposed to drill six to eight exploration wells.

In December 2004, Energem Petrol Corp. Chad Ltd. (a subsidiary of Energem Resources Inc. of Canada) was awarded the Chari West concession in the Doba Basin and the Largeau oil and gas concession in central and northern Chad. In early 2005, Energem Resources acquired 51% interest in Financial Development Corp. plc. In February, Financial Development changed its name to FirstAfrica Oil plc and entered into an agreement to acquire the petroleum exploration concessions in Chad from Energem. FirstAfrica subsequently obtained previously acquired seismic and exploration drilling data on the Chari West concession from ExxonMobil.

Outlook

Potential mineral industry development could be negatively affected by the social instability in eastern Chad that was associated with the military action in the Darfur region of Sudan. Several armed factions engaged in hostilities along the eastern border, including the Chad army; the Socle pour le Changement, l'Unité et la Démocratie; the Front Unique pour le Changement Démocratique au Tchad; and various Darfur rebel groups and Janjaweed militias from Sudan.

Exploration activity in Chad could be adversely affected by residual unrest in the north and leftover antipersonnel and antitank land mines in the Borkou-Ennedi-Tibesti, the Guera, the Moyen Chari, and the Salamat regions. In 2005, another peace accord was signed between the Government and the Mouvement pour la Démocratie et la Justice au Tchad, which operated in the Borkou-Ennedi-Tibesti region of northern Chad. The parties previously had signed peace agreements in January 2002 and December 2003.

Potential mineral industry investment in Chad continue to be adversely affected by the nation's political instability, poor infrastructure, and high energy costs (U.S. Department of State, 2005§).

References Cited

Blustein, Paul, 2005, Chad may alter its pledge on oil funds: The Washington Post, The, December 27, p. D1, D3.

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International Monetary Fund, 2006 (April), Chad, World Economic Outlook Database, accessed April 19, 2006, via URL http://www.imf.org/external/pubs/ft/weo/2006/01/data/dbcselm.cfm?G=2001.

U.S. Department of State, 2005, 2005 Investment climate statement—Chad, accessed April 5, 2006, at URL http://www.state.gov/e/eb/ifd/2005/43022.htm.

World Bank Group, 2006, World Bank suspends disbursements to Chad, accessed April 5, 2006, at URL http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/CHADEXTN/0,,contentMDK:20778928~menuPK:50003484~pagePK:141137~piPK:141127~theSitePK:349862,00.html.

Major Sources of Information

Ministère des Mines et de l'Énergie
Direction de la Recherche Géologique et Minière
B.P. 906
N'Djamena, Chad
Ministère du Pétrole
Direction du Pétrole
B.P. 94
N'Djamena, Chad
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TABLE 1

CHAD: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005
Aggregate, sand, and stone		500	500	300	300	300
Gold, mine output, Au content	kilograms	150	150	150	150	150
Natron (soda ash)		12	12	12	12	12
Petroleum, crude	thousand 42-gallon barrels	--	--	8,600 [4]	61,400 [4]	63,300 [4]
Salt		9	9	9	9	10

-- Zero.

[1] Estimated data are rounded to no more than three significant digits.

[2] Table includes data available through June 12, 2006.

[3] In addition to the commodities listed, other industrial minerals and construction materials (clay, lime, and limestone) are produced, but information is inadequate to make reliable estimates of output.

[4] Reported figure. Production volume was metered on the floating, storage, and offloading vessel offshore Kribi, Cameroon.

THE MINERAL INDUSTRIES OF COMOROS, MAURITIUS, REUNION, AND SEYCHELLES

By Thomas R. Yager

COMOROS

The Union of Comoros is located on three main islands in the Mozambique Channel about two-thirds of the way between northern Madagascar and northern Mozambique. In 2005, the mineral industry of Comoros continued to be limited to the production of such construction materials as clay, sand and gravel, and crushed stone for local consumption. The demand for cement, steel, and petroleum products was met through imports.

In 2004 (the latest year for which data were available), imports of iron and steel were 5,190 metric tons (t) compared with 4,516 t in 2003 and 3,300 t in 1999. The value of iron and steel imports amounted to about $3.4 million in 2004, or nearly 4% of total imports (International Monetary Fund, 2005, p. 35).

Imports of cement were 48,006 t in 2004 compared with 44,255 t in 2003 and 25,094 t in 1999. The value of cement imports amounted to about $4.4 million in 2004, or 5% of total imports (International Monetary Fund, 2005, p. 35).

Fossil fuels provided most of the country's power. Imports of petroleum products were 49,015 t in 2004 compared with 44,662 t in 2003 and 17,144 t in 1999. The value of imported petroleum products amounted to $17.9 million in 2004, or 21% of total imports (International Monetary Fund, 2005, p. 35).

Mineral output was not expected to change significantly because Comoros has very limited mineral resources and weak infrastructure. Import dependence and deforestation may lead to development of the country's geothermal resources.

Reference Cited

International Monetary Fund, 2005, Union of the Comoros—Statistical appendix: Washington, DC, International Monetary Fund, August 16, 43 p.

MAURITIUS

The Republic of Mauritius is located about 1,000 kilometers (km) east of Madagascar. In 2005, Mauritius produced basalt construction stone, lime from coral, sand, semimanufactured steel, and solar-evaporated sea salt. Local companies also cut imported diamond.

Domestic rolling mills produced steel-reinforcing bars (rebar) and welded mesh using imported ingot as raw material. Imports of iron and steel amounted to 105,000 t at a value of $75.2 million in 2005, or about 2% of total imports (Mauritius Central Statistics Office, 2006, p. 20, 23).

United Basalt Products (UBP) was the leading supplier of building products in Mauritius. UBP produced aggregates at 10 locations on the island of Mauritius. On the island of Rodrigues, Welcome Industries Ltd. (a subsidiary of UBP) had an annual production capacity of nearly 150,000 metric tons per year (t/yr) of aggregates. Gamma Civic Ltd. also produced aggregates.

Mauritius did not produce cement in 2005; all the country's cement requirements were imported. In 2005, imports of cement amounted to 694,000 t at a value of $42.3 million, or about 1% of total imports (Mauritius Central Statistics Office, 2006, p. 20, 23).

Mauritius Chemical and Fertilizer Industry Ltd. was the country's only producer of fertilizers. National imports of fertilizers amounted to 62,000 t at a value of $18.1 million in 2005 (Mauritius Central Statistics Office, 2006, p. 20, 23).

Mauritius had no identified resources of fossil fuels. Gamma Civic operated an asphalt plant; the demand for all other petroleum products was met through imports. The value of imported mineral fuels, lubricants, and related products amounted to $515 million in 2005, or 16% of total imports (Mauritius Central Statistics Office, 2006, p. 20-21).

In the short run, the growth in the minerals sector is likely to be restricted to construction materials. Offshore oil exploration has been inconclusive, and polymetallic nodules on the ocean floor are unlikely to be developed in the foreseeable future.

Reference Cited

Mauritius Central Statistics Office, 2006, External trade—4th quarter 2005: Port Louis, Mauritius, Mauritius Central Statistics Office, 29 p.

REUNION

Reunion, which is an overseas department of France, is located about 650 km east of Madagascar. Production of mineral commodities represented only a small part of the economy of Reunion, although little quantitative information was available.

Holcim (Réunion) S.A. produced 380,000 t/yr of hydraulic cement by grinding imported clinker; its plant at Le Port had a capacity of 400,000 t/yr. The company also produced 1.3 million metric tons per year of aggregates from plants at Bras Panon, Sainte-Clotilde, Saint-Joseph, and Saint-Pierre (Holcim (Réunion) S.A., 2003). Additionally, seacoast coral continued to meet local construction needs.

Reunion has no identified resources of coal or petroleum; all petroleum demand was met through imports. In 2004, the Government decided to build a 70-km railway to link St. Benoit, St. Denis, and St. Paul because of increasing road congestion. The railway was expected to be completed in 2012 at a cost of between $1.6 billion and $1.7 billion (International Railway Journal, 2004§[1]).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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SEYCHELLES

The Republic of Seychelles is a group of 40 granitic and 50 or more coralline islands that is located northeast of Madagascar in the Indian Ocean. Mineral production in Seychelles consisted mostly of production of such construction materials as clay, coral, sand, and stone.

Seychelles had no identified resources of fossil fuels. In early 2005, the Government signed an exploration agreement with Petroquest Energy Inc. of the United States to explore for petroleum in an offshore concession that covered 30,000 square kilometers. The concession included areas around Coetivy Island and the Farquhar Islands, on the Constant Bank between Coetivy and Platte Islands, and on the Topaze Bank to the east of Frigate Island (African Energy Intelligence, 2005).

The short-term outlook for mineral production is for little change. Seychelles has modest natural resources, and any newly discovered resources of petroleum and natural gas could not be developed immediately.

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TABLE 1

MAURITIUS, REUNION, AND SEYCHELLES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons)

Country and commodity	2001	2002	2003	2004[e]	2005[e]
MAURITIUS[2]					
Fertilizers	84,278	86,100	82,000	89,400 [3]	90,000
Salt, marine	6,800	7,000	7,200 [e]	7,700	7,900
Sand, coral[e]	410,000	--	--	--	--
Steel, semimanufactures	48,700	52,400	58,700	65,000 [3]	65,000
REUNION[4]					
Cement [e]	380,000	380,000	380,000	380,000	380,000
SEYCHELLES					
Dimension stone, granite	6,044	97,576	92,120	93,000	93,000
Gravel and crushed rock	245,000 [e]	239,746	212,926	213,000	213,000
Sand	8,128	2,840	2,165	2,200	2,200

[e] Estimated; estimated data are rounded to no more than three significant digits. -- Zero.

[1] Table includes data available through March 13, 2006.

[2] In addition to the commodities listed, asphalt, basalt, and lime are also known to be produced, but information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] In addition to the commodity listed, coral and volcanic rock are also known to be produced, but information is inadequate to make reliable estimates of output.

THE MINERAL INDUSTRY OF CONGO (BRAZZAVILLE)

By Philip M. Mobbs

The economy of the Republic of the Congo [Congo (Brazzaville)] was based largely on the production of petroleum, which accounted for a significant segment of the country's export earnings, gross domestic product (GDP), and Government revenues. In 2005, the country had a GDP based on purchasing power parity of $4.6 billion and a GDP per capita based on purchasing power parity of $1,369. The real GDP grew by 9.2% in 2005 compared with a growth rate of 3.6% in 2004 (International Monetary Fund, 2006§[1]).

Congo (Brazzaville) is located in equatorial central Africa and bounded by the Cabinda enclave of Angola and the Democratic Republic of the Congo [Congo (Kinshasa)] to the south and west and by Cameroon, the Central African Republic, and Gabon to the east and north. The country has an area of 342,000 square kilometers that supported a population of about 4 million in 2005. In addition to petroleum and natural gas, Congo (Brazzaville) also produced clays, diamond, gold, lime, sand and gravel, and stone. The manufacturing of cement and the production of potash were expected to resume in the near future, and the initial production of magnesium and salt was also planned.

Commodity Review

Metals

Magnesium.—In 2005, Magnesium Alloy Corp. of Canada changed its name to MagIndustries Corp. MagIndustries created MagMetals Inc. to develop the 72,000 metric-ton-per-year (t/yr)-capacity Kouilou magnesium smelter, which was to be built adjacent to a proposed potash plant near Pointe Noire in the Kouilou region. MagMetals proposed to acquire power for the smelter from the Inga II hydroelectric generating facility in Congo (Kinshasa). In 2005, MagEnergy Inc. (also a subsidiary of MagIndustries) began a feasibility study on the rehabilitation of the Inga II powerplant and installation of an electric-power transmission line to the smelter (MagIndustries Corp., 2006, p. 1).

Industrial Minerals

Potash and Salt.—In 2005, MagIndustries also created MagMinerals Inc. which began a feasibility study on the development of a 400,000-t/yr-capacity potash plant. The proposed plant was to be located about 15 kilometers from Pointe Noire (MagIndustries Corp., 2006, p. 1).

MagAlloy Congo S.A. was renamed MagMining Congo S.A., which was a partnership of MagIndustries (90%) and the Government (10%). MagMining was to manage the solution mining of halite and carnalite in the Makola License area, which was adjacent to MagMinerals' proposed potash plant plot.

Mineral Fuels

Natural Gas and Petroleum.—Most of the country's hydrocarbons were produced from offshore fields. Most associated natural gas produced in Congo (Brazzaville) was flared because of the lack of gas-gathering infrastructure; some of the natural gas produced, however, was diverted to be used as fuel at the Djeno power station, which was located south of Pointe Noire; some was reinjected to maintain hydrocarbon reservoir pressure; and some was stripped of liquids (butane and propane) on the Nkossa offshore barge. MagMinerals proposed to capture some of the flared natural gas for use at its potash plant.

Several subsidiaries of the state-owned Société Nationale des Pétroles du Congo (SNPC) managed the Government's interest in petroleum and natural gas. Société Nationale de Recherche et d'Exploration Pétrolière was the SNPC's exploration and production company.

Total Exploration & Production Congo (a subsidiary of Total S.A. of France) was the major private operator in the petroleum sector of Congo (Brazzaville). Other oilfield operators included Agip Congo S.A. (a subsidiary of Eni S.p.A. of Italy), Likouala S.A. of Congo (Brazzaville), Maurel & Prom of France, and the Perenco Group of France and the United Kingdom.

Outlook

Revenues from the petroleum sector, which will remain the cornerstone of the country's economy for the immediate future, provided the funding for Congo (Brazzaville)'s continued recovery from the 1997 civil war. National production of petroleum is expected to rebound with the development of additional oilfields, which include the Moho-Bilondo prospect that is expected to come onstream in 2008. The Government's interest in the extracting income from associated natural gas, which currently (2005) is being flared, also is expected to increase. Initiation of production from the proposed Kouilou magnesium and potash project and resumption of cement production from the Société Nouvelle de Ciment du Congo's rehabilitation of the Loutete cement plant would help to diversify the economy and aid development of the country's power infrastructure.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Major Source of Information

Ministère des Mines, des Industries Minières et de la Géologie
Service des Mines et de la Géologie
B.P. 2124
Brazzaville, Republic of the Congo
Telephone: (242) 83 58 73
Fax: (242) 83 62 43

TABLE 1

CONGO (BRAZZAVILLE): ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

Commodity[3]		2001	2002	2003	2004	2005
Diamond	carats	50,000	25,000	30,000	50,000	50,000
Gold, mine output, Au content	kilograms	10	10	75	60	20
Lime	metric tons	390	390	390	400	400
Liquid petroleum gas, propane	thousand 42-gallon barrels	3,734 [4]	3,000	1,900	919 [4]	766 [4]
Petroleum:						
Crude	do.	98,920 [4]	94,170 [4]	81,646 [4]	82,069 [4]	92,550 [4]
Refined	do.	2,752 [4]	2,800	2,700 [r]	2,700 [r]	3,000

[r] Revised.

[1] Estimated data are rounded to no more than three significant digits.

[2] Table includes data available through September 30, 2006.

[3] Crude construction materials (for example, clay, sand and gravel, and stone) were produced, but information is inadequate to make estimates of output. Natural gas is also produced, but output is flared, reinjected, or vented.

[4] Reported figure.

THE MINERAL INDUSTRY OF CONGO (KINSHASA)

By Thomas R. Yager

The Democratic Republic of the Congo [Congo (Kinshasa)] was a producer of cobalt, columbium (niobium) and tantalum, copper, germanium, gold, tin, and zinc ores, and small amounts of steel and refined cobalt. The country also produced cement, crushed stone, diamond and colored gemstones, coal, and crude petroleum.

In 2005, the nominal gross domestic product (GDP) based on purchasing power parity of Congo (Kinshasa) amounted to about $46.5 billion; the per capita GDP was about $770. The real GDP increased by 6.5% in 2005 compared with 6.9% in 2004. The mining sector accounted for 10% of the GDP; manufacturing, 5%; construction and public works, 4%; and electricity and water, 3%. In 2004, the mining sector grew by an estimated 16% compared with 13% in 2003 and 10% in 2002 (International Monetary Fund, 2005, p. 60, 62; 2006§[1]).

In spite of the signing of a peace agreement and the formation of a transitional Government in 2003, civil unrest continued in eastern and southern Congo (Kinshasa) in 2005. The Government was engaged in conflict with the Forces Démocratiques de Libération du Rwanda and the Mayi-Mayi militia in South Kivu, which was located in the eastern part of the country. Conflict between the Government and the Mayi-Mayi militia also took place in Katanga Province in eastern Congo (Kinshasa) (Global Witness, 2005, p. 8, 16; United Nations Integrated Regional Information Networks, 2005a, b).

Commodity Review

Metals

Cobalt and Copper.—Congo (Kinshasa) was the world's leading cobalt mine producer. Mine production of cobalt increased to an estimated 22,000 metric tons (t) in 2005 from 20,500 t in 2004, and refined cobalt production declined to 600 t in 2005 from 735 t in 2004. In 2005, mine production of copper increased to an estimated 92,000 t from 73,300 t in 2004 (table 1).

In 2005, Chemaf SPRL produced copper at a rate of 2,500 metric tons per year (t/yr), and cobalt, at a rate of 500 t/yr. In October, the company completed a new processing plant with a capacity of 4,000 t/yr of cobalt. Chemaf planned to produce 10,000 t/yr of copper and 3,000 t/yr of cobalt. By the end of 2006, Chemaf planned to complete a bankable feasibility study on mining the Etoile deposit. If the feasibility study were to yield favorable results, the company planned to have finances in place in the first quarter of 2007 and to start mining by the first quarter of 2009. Production was expected to be 24,000 t/yr of copper and 4,000 t/yr of cobalt; Chemaf planned to build a concentrator plant and a solvent extraction/electrowinning facility at a cost of $64 million (Chemaf SPRL, undated§).

First Quantum Minerals Ltd. of Canada produced copper ore from the Lonshi Mine; the company shipped its ore across the border with Zambia to the Bwana Mkubwa solvent extraction/electrowinning facility. In 2005, the Lonshi Mine produced 980,000 t of ore at a grade of 5.1% copper compared with 669,000 t of ore at a grade of 5.5% copper in 2004. Bwana Mkubwa produced 49,538 t of copper in 2005 compared with 41,546 t in 2004. Production at Bwana Mkubwa was expected to be between 45,000 t and 50,000 t in 2006 (First Quantum Minerals Ltd., 2006, p. 9, 14).

Anvil Mining Ltd. of Australia operated the Dikilushi copper mine, which is located near Lake Mweru in Katanga Province. The company exported copper concentrates from the Dikilushi Mine to Namibia for smelting. In 2005, Anvil produced 17,816 t of copper compared with 12,074 t in 2004. In June 2005, Anvil completed a 50% expansion that raised the production capacity to 20,000 metric tons per year (t/yr) of copper (Anvil Mining Ltd., 2005; 2006, p. 6-7).

In 2006, Anvil planned to start development of an underground mine at Dikilushi. The open pit reserves were expected to be depleted in the second half of 2007. After the shutdown of the open pit mine, the processing plant was expected to process ore from stockpiles for 7 months as the underground mine was phased in (Anvil Mining Ltd., 2006, p. 7).

Anvil was engaged in a joint-venture agreement with state-owned Generale Des Carriers Et Des Mines (Gecaminés) and DeMoura Enterprises to mine the Kulu deposit. Mining started at Kulu in December 2005; production amounted to 2,493 t of concentrate that contained 711 t of copper. In 2006, copper production was expected to be 16,500 t. Anvil planned to complete a feasibility study on building a solvent extraction/electrowinning facility at Kulu with a capacity of 30,000 t/yr. If the study were to yield favorable results, the plant was expected to be completed in the first quarter of 2008 (Anvil Mining Ltd., 2006, p. 9).

In the fourth quarter of 2005, Anvil finalized negotiations with Gecaminés and Mining Company Katanga s.p.r.l. (MCK) to acquire a 70% interest in the mining rights for the Kinsevere and the Nambulwa deposits in Katanga. Anvil and MCK completed exploration at Kinsevere in 2005 that established a resource of 8.4 million metric tons (Mt) at a grade of 4.1% copper. Anvil and MCK planned additional exploration after March 2006 (Anvil Mining Ltd., 2006, p. 11).

Gecaminés and its joint-venture partners produced 19,700 t of copper in 2004 compared with 16,400 t in 2003. The company's production has been inhibited by aging equipment; a lack of investment, fuel, and spare parts; and poor infrastructure. In 2006, Gecaminés expected its copper production to be 25,000 t; cobalt, 2,000 t; and zinc, 5,000 t (International Monetary Fund, 2005, p. 66).

Adastra Minerals Inc. of the United Kingdom and Gecaminés planned to complete a feasibility study of the development of the Kolwezi Tailings Project in the first quarter of 2006. If the study were to yield favorable results, construction was expected to start by the end of 2006; production was likely to start in the first quarter of 2008. The initial production level was planned to be 30,000 t/yr of copper and 5,000 t/yr of cobalt. Resources were estimated to be nearly 113 Mt at grades of 1.49% copper and 0.32% cobalt (Adastra Minerals Inc., 2005b).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

In the fourth quarter of 2005, the Government approved the Tenke Fungurume joint-venture project between Phelps Dodge Corp. of the United States (57.75%), Tenke Mining Corp. of Canada (24.75%), and Gecaminés (17.5%). The companies planned to complete a feasibility study by mid-2006. If the study were to yield favorable results, production was expected to begin at a rate of 50,000 t/yr of copper and 4,000 t/yr of cobalt in early 2008. Copper production was expected to be 130,000 t/yr by 2013 and 400,000 t/yr by 2018. Resources at Tenke Fungurume were estimated to be 547 Mt at grades of 3.5% copper and 0.27% cobalt (Tenke Mining Corp., 2005).

Ruashi Mining SPRL (Metorex Ltd. of South Africa, 80%, and Gecaminés, 20%) planned to produce cobalt and copper from tailings near the Ruashi Mine. The company planned to commission a processing plant in April 2006 that was expected to reach full capacity in June 2006. Production was expected to be 10,000 t/yr of copper and 1,000 t/yr of cobalt. Resources in the tailings stockpile amounted to 3.2 Mt at grades of 1.86% copper and 0.35% cobalt. The life of the first phase of the project was likely to be about 4 years. The second phase of the project involved mining the Ruashi ore body, which had resources of 32.5 Mt at grades of 3.75% copper and 0.46% cobalt. The feasibility study of the second phase was expected to be completed in 2006. If the study were to yield favorable results, construction could start in January 2007 and mining of the Ruashi ore body, in July 2008. Production was expected to be between 40,000 and 45,000 t/yr of copper and 3,500 and 7,000 t/yr of cobalt (Metorex Ltd., 2005, p. 18; Miningmx, 2005).

Central African Mining and Exploration Company plc (CAMEC) of the United Kingdom and Enterprises Swanepoel were engaged in a joint venture to build cobalt and copper processing plants at Kambove. The cobalt plant was expected to start production in early 2006; initial capacity was expected to be more than 1,400 t/yr of cobalt in concentrates. By the end of the first quarter of 2006, an electric arc furnace with a capacity of 2,800 t/yr of blister copper was expected to be completed. The furnace was also capable of producing tin (Central African Mining and Exploration Company plc, 2005a, b).

Columbium (Niobium) and Tantalum.—The production of columbium (niobium) and tantalum in Congo (Kinshasa) has declined sharply in recent years. In 2005, production of columbium (niobium) declined to an estimated 10 t from nearly 390 t in 2003 and 700 t in 2002.

In July 2000, the Lueshe pyrochlore mine in Rutshuru District reopened; the mine had closed in July 1993 because of civil war in North Kivu. Production of pyrochlore from the Lueshe Mine was 733 t in 2003 compared with 1,346 t in 2002, 691 t in 2001, and 274 t in 2000 (table 1). Historically, the mine produced a pyrochlore concentrate with a content of between 69% and 73% Nb_2O_5. The mine shut down again in October 2003. In March 2005, the Government announced that it was seeking investors to reopen the Lueshe Mine. The costs required to rehabilitate the mine and establish a production rate of 1,800 t/yr of Nb_2O_5 were estimated to be $11.5 million. The reopening of the mine was likely to be inhibited by disputes over mining rights (Heydari, 1993; Johnson and Tegera, 2005, p. 76-81).

Artisanal and small-scale miners produced columbium (niobium) and tantalum in eastern Congo (Kinshasa). In 2004, reported exports of columbite-tantalite from North Kivu were 42 t compared with 71 t in 2003. The decline in tantalum prices and the increase in tin prices led to artisanal miners abandoning columbite-tantalite mining in favor of cassiterite. In March 2005, the Government announced that it was seeking investors to produce 380 t/yr of columbite-tantalite from the Manono Mines (Johnson and Tegera, 2005, p. 30, 35-36, 49).

Gold.—Artisanal and small-scale miners produced gold in Ituri Province in eastern Congo (Kinshasa). National gold production was estimated to be 4,200 kilograms (kg) of gold in 2005 compared with 5,700 kg in 2004 and 6,100 kg in 2001 (table 1).

Moto Goldmines Ltd. of Australia explored for gold in the Kilo Moto goldfield in Ituri Province. The Moto Project included the Gorumbwa, the Karagba, the Kibali, the Kombokolo, the Marakeke, the Megi, the Mengu Hill, the Mengu Village, the Ndala, the Pakaka, the Pamao, and the Sessenge deposits. Moto reported that a new resource estimate completed in November 2005 increased combined resources of these deposits to more than 340 t of contained gold from 250 t. Resources at Karagba were reported to be 113 t of contained gold; Gorumbwa, 54 t; Pakaka, 47 t; and Kibali, 44 t (African Mining, 2006b).

Moto planned to finish prefeasibility work on the Moto project by mid-2006 and to complete a bankable feasibility study on mining in 2007. If the feasibility study were to yield favorable results, the mine was expected to produce about 7,500 kilograms per year (kg/yr) of gold at an average cash operating cost of $220 per troy ounce of gold. The life of the potential mine was expected to be 12 years (African Mining, 2006c).

Banro Corp. of Canada owned the Kamituga, the Lugushwa, the Namoya, and the Twangiza properties in eastern Congo. The company began exploration at Namoya in December 2004 and at Lugushwa in January 2005. Resources at Twangiza were estimated to be 99 t of contained gold; Lugushwa, 85 t; Namoya, 34 t; and Kamituga, 28 t (African Mining, 2006a).

CAMEC explored for gold at its Moba project, which comprised nine exploration permits that covered 3,250 square kilometers (km^2). The Moba project focused on the Lufuka River Valley, which was in the Tanganyika District of Katanga Province (Central African Mining and Exploration Company plc, 2005a).

Silver.—Anvil produced silver as a coproduct at the Dikilushi copper mine. In 2005, silver production increased to 53,553 kg from 32,953 kg in 2004. Production increased because of a 50% expansion of the mine that was completed in June 2005 and that raised production capacity to 50,000 kilograms per year of silver (Anvil Mining Ltd., 2005; 2006, p. 6-7).

Tin.—Artisanal miners produced cassiterite at the Manono mine in Katanga Province; at Kalima and Punia in Maniema Province; at the Bisuru Bibatama Mine near Masisi and the Bisie Mine near Walikale in North Kivu Province; and at Nyabibwe in South Kivu Province. National tin mine production increased to an estimated 3,200 t in 2004 from 800 t in 2003 and 300 t in 2002 (table 1) because of rising global demand for tin. The increase in tin demand was partially attributable to environmental regulations in Europe and Japan that mandated the reduction of lead use in printed circuit boards. In 2005, tin production declined to an estimated 2,800 t because of lower tin prices (Global Witness, 2005, p. 4, 14; Johnson and Tegera, 2005, p. 49-50, 53).

The reported production of cassiterite in North Kivu amounted to 550 t in 2001 and 497 t in 2002. In 2003, 938 t of cassiterite was exported from North Kivu and 488 t from South Kivu. Exports of cassiterite from North Kivu amounted to 4,672 t in 2004, of which between 85% and 90% was produced in North Kivu; exports from South Kivu amounted to 715 t. In the first 6 months of 2005, reported exports of cassiterite from Goma in North Kivu were 2,191 t, and from Buakavu in South Kivu, nearly 179 t (Johnson and Tegera, 2005, p. 49-52).

Most of the companies that exported cassiterite from Congo (Kinshasa) shipped concentrates with a tin content of between 55% and 60%. Metal Processing Association (MPA) exported cassiterite to Rwanda for further processing; the company produced about 200 t/yr at its tin smelter. Sodex Mines reportedly processed cassiterite concentrates to a tin content of 78% prior to export. In the first half of 2005, Sodex accounted for 23% of exports compared with 11% in 2004; MPA's share declined to 15% from 31% (Johnson and Tegera, 2005, p. 50-52).

In December 2004, MPA was awarded 37 concessions in eastern Congo (Kinshasa) that it planned to bring into production in 2005 or 2006. The company planned to spend $30 million to build a new smelter with a capacity of 5,000 t/yr. MPA expected to export 400 t/yr of tin to South Africa and substantial amounts to China (Global Witness, 2005, p. 20).

In March 2005, the Government announced that it was seeking investors to produce 6,000 t/yr of cassiterite from the Manono Mines. The cost of developing the proposed columbite-tantalite and cassiterite mining projects at Manono was estimated to be $155 million (Johnson and Tegera, 2005, p. 35-36).

Zinc and Germanium.—In September 2005, Adastra renewed its joint-venture agreement with Kumba Base Metals (a subsidiary of Kumba Resources Ltd. of South Africa) to reopen the Kipushi zinc-copper mine. The companies were engaged in a reassessment of the project's viability. Measured and indicated resources at the Kipushi mine were 16.9 Mt at grades of 16.7% zinc and 2.32% copper (Adastra Minerals Inc., 2005a).

Gecaminés and Enterprises Swanepoel SARL were in a joint venture to develop a project to reprocess zinc and germanium tailings near the Kolwezi mine. Resources were estimated to be 1 Mt at grades of 20% zinc, 500 g/t germanium, and 200 g/t silver. Following the completion of a metallurgical process study, the company planned to make a decision by mid-2006 (Central African Mining and Exploration Company plc, 2005a).

Industrial Minerals

Diamond.—National diamond production amounted to an estimated 30.3 million carats in 2005 compared with nearly 30.9 million carats in 2004 and 16 million carats in 2000. Diamond exports were $679 million for the first 9 months of 2005 (International Monetary Fund, 2005, p. 86; Johnson and Tegera, 2005, p. 96).

State-owned Sociètè Minièrè de Bakwanga (MIBA) produced mostly industrial and near-gem-quality diamond at Mbuji-Mayi in Kasai-Oriental Province. The company mined about 7.24 million carats of diamond in 2004. MIBA planned to increase production to 8.5 million carats in 2006 and 10 million carats in 2008 and to raise the percentage of gem-quality diamond mined to 6% in 2008 from less than 4% in 2003. In May 2005, a new kimberlite-processing plant was commissioned at Mbuji-Mayi (Tshofu, 2004; Arenson, 2005; Northwest Territories Department of Industry, Tourism and Investment, 2005, p. 11).

Sengamines (Oryx Natural Resources Ltd., 80%, and MIBA, 20%) operated a diamond mine that was located 40 kilometers southwest of Mbuji-Mayi in Kasai Oriental Province. The company produced 302,033 carats in 2005 compared with 618,059 carats in 2004 and 1.09 million carats in 2003. Sengamines planned to produce between 2.4 million and 4 million carats per year and to increase production subsequently to at least 4.8 million carats per year. The mine was shut down in May 2005 because of fuel delivery problems (Tassell, 2004; Arenson, 2005).

In early 2005, the privately owned Congolese company Midamines SPRL started diamond production. The company planned to mine 200,000 carats per year of diamond from alluvial deposits in the riverbeds of the Dinini, the Gombe, the Kwango, and the Tungila Rivers and their tributaries in Bandundu and Kasai Occidental Provinces. Resources at these deposits were estimated to be at least 7.2 million carats of diamond; about 75% of the diamond was estimated to be gem quality (Arenson, 2005; Midamines SPRL, undated§).

An estimated 700,000 artisanal miners produced diamond at Luozi in Bas-Congo Province; at Gbadolite, Kota-Koli, and Yakoma in Equateur Province; at Bafwasende and Kisangani in Haut-Congo Province; at Lubutu in Maniema Province; and at various operations in Bandundu, Kasai-Occidental, and Nord Kivu Provinces. Artisanal diamond production was estimated to be 22 million carats in 2005 (International Monetary Fund, 2005, p. 48-49, 66).

Gravity Diamonds Ltd. of Australia and BHP Billiton Ltd. of Australia signed a joint-venture agreement in 2004 to explore for diamond at Gravity's Gunge, Luebo, Maniamuna, and Penge concessions on the Kasai Craton. Between April and October 2005, Gravity explored at Gunge, Maniamuna, and Penge; the company started a drilling program at Luebo in November. Gravity spent $5 million on exploration in 2004 and 2005; the company planned to spend an additional $3 million to $4 million in 2006 (Mining Review Africa, 2006).

SouthernEra Diamonds Inc. of Canada held 41 exploration permits near Mbuji-Mayi that covered about 13,600 km^2; these properties were thought to contain primary and alluvial deposits. The company explored at its properties in the Tshikapa/Kasai/Luebo alluvial diamond field in Kasai-Occidental Province and at its Nyota project in Kasai-Oriental Province. CAMEC held exploration licenses for properties that covered nearly 4,900 km^2 in the Sankuru District of Kasai Province. The company explored for diamond at these properties, which have alluvial deposits that have been mined by artisanal miners. BRC Diamond Corp. of Canada started diamond exploration in Kasai-Oriental Province at the end of 2004 (Arenson, 2005; Central African Mining and Exploration Company plc, 2005a).

Stone, Crushed.—National production of crushed stone amounted to 213,000 t in 2004 compared with 203,000 t in 2003. In late 2005, Adastra was awarded quarry exploration rights for eight limestone concessions and two aggregates concessions near the Kolwezi Tailings Project. The project's processing plant was expected to consume 30,000 t/yr of lime and limestone (Adastra Minerals Inc., 2005b).

Outlook

Production of cobalt, copper, diamond, germanium, gold, and tin in Congo (Kinshasa) could rise and zinc production could restart in the near future. Cobalt and copper production could increase because of the Kambove, the Kolwezi tailings, the Mutoshi, the Ruashi, and the Tenke Fungurume projects; diamond, because of the expansion of MIBA's operations; gold, because of the Moto project; tin, because of a new smelter proposed by MPA; and zinc and germanium, because of the Kipushi and the Kolwezi projects. The development of these projects depends heavily upon political and economic stability and favorable conditions in world markets. The outlook for gold and tin is particularly dependent upon political stability because of continued civil unrest in eastern Congo (Kinshasa).

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TABLE 1
CONGO (KINSHASA): PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[e]
METALS						
Cobalt:						
Mine output, Co content[e, 2]		11,600	14,500 [r]	14,500 [r]	20,500 [r]	22,000
Metal, Co content[3]		3,199	2,149	1,200	735	600
Columbium (niobium) and tantalum:						
Columbite-tantalite concentrate:						
Gross weight		200 [e]	110 [r]	71 [r]	42 [r]	45
Nb content[e]		60	25 [r]	15 [r]	10 [r]	10
Ta content[e]		60	30	20 [r]	10 [r]	10
Pyrochlore concentrate:						
Gross weight		691	1,346	733	--	-- [4]
Nb content[e]		340	670	360	-- [4]	-- [4]
Copper:						
Mine output, Cu content		37,800	34,000 [e]	59,800	73,300	92,000
Smelter, electrowon (low grade)		25,000	10,000	8,000	20,000	20,000
Germanium	kilograms	--	3,500	2,500	2,500	2,500
Gold, mine output, Au content[e]	do.	6,100	7,600	4,100	5,700	4,200
Silver, mine output, Ag content	do.	--	2,108	35,501	32,953	53,553 [4]
Steel		307,000	150,000	140,000	130,000	130,000
Tin, mine output, Sn content[e]		300 [r]	300 [r]	800	3,200 [r]	2,800
Zinc, mine output, Zn content		1,014	828 [r]	--	5,067 [r]	15,000
INDUSTRIAL MINERALS						
Cement, hydraulic		201,000	265,000	331,000	402,500	410,000
Diamond:[5]						
Artisanal	thousand carats	11,843	15,629	19,142	22,128	22,000
Large-scale	do.	6,355	6,050	7,839	8,752	8,300
Total	do.	18,198	21,679	26,981	30,880	30,300
Lime[e]		25,000	25,000	25,000	25,000	25,000
Stone, crushed		185,000	194,000	203,000	213,000	220,000
Sulfuric acid[e]		80,000	80,000	80,000	15,000	15,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous[e]		1,000	1,000	1,000	1,000	1,000
Petroleum, crude	thousand 42-gallon barrels	9,400	8,400	9,200	10,100	10,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through November 3, 2006.

[2] Includes mine production and reprocessed tailings.

[3] Salable refined production only; excludes white alloy and matte.

[4] Reported data.

[5] An estimated 20% of total diamond is gem quality; the majority of production is from artisanal mining.

THE MINERAL INDUSTRY OF DJIBOUTI

By Thomas R. Yager

Djibouti, which is a small East African country located at the southern end of the Red Sea, was a producer of salt and such construction materials as basalt. Other mineral occurrences of potential economic interest included diatomite, geothermal fluids and mineral salts, gold, gypsum, perlite, petroleum, and pumice.

In February 2004, Green River Geology Co. Pty. Ltd. and Westgold Resources NL of Australia formed a joint venture to explore for gold on two properties in Djibouti. After conducting further exploration work in 2005, Westgold decided to sell its interest in the joint venture to concentrate on its Australian properties (Westgold Resources NL, 2006).

Salt production started on a semi-industrial scale at Lake Assal in 1998 and reached a peak of 173,099 metric tons in 2001 as Djibouti replaced Eritrea as Ethiopia's source of salt imports. In October 2003, Ethiopia imposed a 53% tariff on imports of salt from Djibouti as part of its plan to achieve self-sufficiency in salt production. Djibouti's salt production and exports declined sharply as a result (Harris, 2004; Banque Centrale de Djibouti, undated, p. 20-21).

The outlook for Djibouti's mineral industry is for little growth in the short run; constraints include small domestic markets, minimal identified natural resources, and high electricity costs. Development of geothermal and wind energy could lead to lower costs. Resources of geothermal energy, in terms of potential generating capacity, have been estimated to be between 230 and 860 megawatts (MW) and wind, at least 100 MW (Business Council for Sustainable Energy, 2003, p. 47-49; International Monetary Fund, 2004, p. 59-60).

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TABLE 1
DJIBOUTI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2001	2002	2003	2004[e]	2005[e]
Salt	173,099	162,266	128,494	30,000	30,000

[e] Estimated; estimated data are rounded to no more than three significant digits.

[1] Table includes data available through March 13, 2006.

THE MINERAL INDUSTRY OF EGYPT

By Harold R. Newman

Petroleum and petroleum products were the top export commodities in 2005 as the mineral fuels sector continued to be a vital segment of, and a major contributor to, the economy of Egypt. Government efforts were focused mainly on the further development of the country's mineral resources. Geologic studies had pointed out that Egypt has reserves of different minerals, such as black sand, gold, granite, marble, and phosphate rock. A national plan was being prepared to develop investment opportunities in mineral resources. Also, the Government was engaged in efforts to partially privatize mining and metal assets (Arabic News, 2005§[1]).

Egypt was one of the world's leading energy producers, and this sector, which was the single largest industrial activity in the country, accounted for 12% of the gross domestic product (GDP). Exports of petroleum and related products were valued at more than $2.7 billion in fiscal year 2005. Egypt was encouraging the production of natural gas. Natural gas accounted for almost 50% of all hydrocarbon use in Egypt (U.S. Department of State, 2005§).

Egypt's estimated GDP based on purchasing power parity was about $305 billion. The estimated GDP per capita based on purchasing power parity was $4,317. The estimated annual inflation rate was 11%, and the estimated growth rate was 4.8% (International Monetary Fund, 2006§). The country had a land area of 1,001,450 square kilometers (km^2) and an estimated population of 79 million (U.S. Central Intelligence Agency, 2006§).

Economic development was placing stress on Egypt's environment. Population density combined with postponed infrastructure investment had overwhelmed water service, and wastewater service was creating environmental hazards. The main environmental issues Egypt faced were air pollution, carbon dioxide emissions, and preservation of coastal areas. Also, the Nile River and its tributaries were being contaminated with chemicals, heavy metals, and other pollutants (U.S. Energy Information Administration, 2005§).

The Ministry of Industry and Mineral Resources, through the Egyptian Geological Survey and Mining Authority (EGSMA), was the Government agency responsible for regulating the exploitation, exploration, and prospecting of all mineral deposits in Egypt. The law that regulated the mining sector was the Mining and Petroleum Code law No. 66 of 1953. The Electricity and Energy Ministries were the main Government agencies responsible for the energy sector.

The Organization for Energy Planning was the Government office responsible for analyzing energy policies and energy supply and demand, evaluating energy resources, and developing technical expertise in the field. Government-owned Egyptian Electric Holding Company was responsible for the country's power generation and owned electrical distribution companies.

Besides mineral fuels, Egypt also produced aluminum, ferroalloys, iron ore, secondary copper, and steel. Industrial minerals produced included construction materials, gypsum, and raw materials for glass.

Commodity Review

Metals

Aluminum.—State-owned Holding Company for Metallurgical Industries (HCMI) announced a public offering of 17% of its shares in Aluminium Company of Egypt (Egyptalum). Egyptalum was 92.2% owned by HCMI, whose shares would be reduced to 75.2%. Egyptalum was the only aluminum producer in Egypt and produced from six lines at its Nag Hammadi plant. In 2005, the plant was being expanded from its capacity of 190,000 metric tons per year (t/yr) to 230,000 t/yr during a 2-year period. Egyptalum recorded sales of $531 million in 2005 (Middle East Economic Digest, 2006).

Gold.—Centamin Egypt Ltd. of Australia was continuing its geologic mapping, prospecting, and sampling programs in 2005. Centamin had a 160-km^2 exploitation lease for the Sukari Hill gold project and was continuing with a feasibility study to upgrade the project. In 2005, the resource at Sukari was estimated to be 6.79 billion kilograms of gold, which was an increase of 131% in slightly more than 1 year. Extraction was expected to be by open pit mining (Centamin Egypt Ltd., 2006§).

Gippsland Ltd. of Australia announced results from trenching at its Wasi Allaqi gold project in southeastern Egypt. Within the 12,000-km^2 Wadi Allaqi area, about 19 historical gold deposits were known. Gippsland's eight gold projects included Haimur, Nile Valley Block A, Nile Valley Block E, Seiga, Umm El Tuyer, Umm Garayat Koleit, Umm Uurayyat, and Umm Shashoba. Sixteen trenches with a combined length of 1,540 meters (m), were completed at the Haimur and the Umm Garayat Koleit sites; an additional six trenches totaling 303 m in length were completed at Seiga. The results of the projects included 15.5 m at a grade of 9.25 grams per metric ton (g/t) at Seiga and 5 m at a grade of 44.5 g/t at Haimur. The trenching program at Umm Garayat Koleit, Haimur, and Seiga determined that the gold mineralization extends for a length of 250 m and was open to the north and south and, in part, to the east and west (Mining Journal, 2005a).

Iron and Steel.—Ezz El-Dekheila Group (EZDK) was Egypt's leading steel producer with a 5.4-million-metric-ton-per-year (Mt/yr) production capacity. EZDK operated some of the most modern steel plants in the world. These included Alexander National Iron and Steel Co., which was the leading integrated steel plant in Egypt with 2.8 Mt/yr of capacity, and which produced 1.8 Mt/yr of rebars and coil rods and 1 Mt/yr of hot-rolled coils; Al Ezz Flat Steel Co., which produced 1.2 Mt/yr of rolled flat sheets; Al Ezz Steel Rebars Co., which produced 1.4 Mt/yr of rebars (EZDK Group, 2005§). EZDK reported that its total exports were valued at $625 million in 2004 and that the value of the group's total exports were expected to reach $900 million in 2005 (News Flash, 2005§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Egyptian Ferroalloys Co. (Efaco) produced ferroalloys with silicon content percentages that ranged from 45% to 75%; the 75% concentration was mostly in the ferrosilicon product. Silica fumes were produced as a byproduct of ferroalloy production. Efaco's Aswan plant at Edfu was considered to be the leading integrated industrial center in the Middle East. The Government announced that Efaco was one of six state-run operations being considered for privatization in 2006. The Government had sold 190 state-run companies since the early 1990s (BBC News, 2005§).

Magnesium.—Magnesium International Ltd. (MIL) of Australia announced that development of its proposed 88,000-t/yr magnesium plant at Ain Sokhna had been delayed by a significant rise in the forecasted capital cost. The smelter would be owned and operated by Egyptian Magnesium Co. (EMAG). The EMAG project was a joint venture between MIL and Amiral Overseas Magnesium of Egypt (50% each) (Platts Metals Week, 2005§).

EMAG continued to work with the Government-owned company El Nasr Mining Co. to explore for magnesite deposits in Egypt. El Nasr Mining, EMAG, and MIL were developing an exploration program for magnesite at Sul Hamed in the far southeastern region of Egypt. Access to proven deposits would reduce the costs of ore supply to the smelter (Magnesium News, 2005§).

Tantalum and Tin.—Gippsland was continuing development of its Abu Dabbab tantalum and tin project as a joint-venture project with EGSMA. Tantalum Egypt LLC was the operating company in which Gippsland and EGSMA each had a 50% interest. Production was expected to begin in mid-year 2006. Abu Dabbab was expected to produce about 1,530 t/yr of tin as a byproduct alongside 260 t/yr of tantalum pentoxide. The Government abolished the 5% royalty tax on gross sales revenues that was to be levied on production. Tantalum Egypt also owned the mining license for the estimated 98-Mt Nuweibi tantalum deposit, which is located 17 kilometers from the Abu Dabbab project (Mining Journal, 2005b).

Industrial Minerals

Cement.—The Italcementi Group's Ciments Français S.A. successfully concluded the purchase of a 33.4% stake in Suez Cement Company. As a result of the purchase, Ciments Français became the majority shareholder (about 54.2%) in Suez Cement. Suez Cement, which had a market share of more than 22%, was the leading player in the Egyptian cement sector and one of the leading cement companies in the Mediterranean region. Suez Cement operated three production facilities—Suez, Qattamiah, and Tourah; all were equipped with rotary kilns capable of producing about 8 Mt/yr both for the domestic and export markets (Ciments Français S.A., 2005b§).

Ciments Français signed an agreement for the purchase of 68.7% stake in Arab Swiss Engineering Company (ASEC), which was the fifth ranked cement company listed on the Cairo and Alexandria Stock Exchange. The acquisition of ASEC would be completed through Suez Cement, of which Ciments Français had acquired control earlier in 2005. The acquisition would allow Ciments Français to reinforce its role as an industry leader in Egypt, which was the fourth ranked market in the Mediterranean region in terms of cement consumption. Through the combination of the two companies, Ciments Français' production capacity in Egypt would increase to more than 12 Mt/yr of clinker with a domestic market share of more than 30% for grey cement and 50% for white cement (Ciments Français S.A., 2005a§).

FL Smidth of Denmark was awarded a $72 million contract to provide engineering services and equipment to Arabian Cement Company (ACC) for a new clinker production plant near the city of Suez. The new facility was scheduled to be completed by mid-2008. Production was expected to be 6,000 metric tons per day of clinker, all of which was destined for export. ACC was a subsidiary of Cementos La Union of Spain (Middle East Economic Digest, 2005c).

Nitrogen.—Financial closure was achieved for the debt and equity portions of the planned Egypt Basic Industries Company (EBIC) ammonia project with the raising of $540 million. The 2,000-metric-ton-per-day-capacity ammonia plant would be the largest of its kind in Egypt, as measured by production quantities. EBIC was the project company comprised of state-owned Egyptian General Petroleum Corp (EGPC), Kellogg Brown & Root Inc. (KBR) of the United States, and PSK Holdings Pty. Ltd. and Orascom Construction Industries, both local companies. The industrial complex was to include a pipeline corridor that would connect the ammonia production plant to product storage tanks located in Sokhna Port. Transammonia Corp. of the United States, which was a specialized international trader, would be the sole buyer of the plant's output (Middle East Economic Digest, 2005a).

Phosphate Rock.—El Nasr Mining Company (NMC) was one of the leading mining companies in Egypt, with activities that extended from Alexandria in the north to Aswan in the south. NMC announced that it had agreed to set up a joint-venture project with the Indian Farmers Fertilizer Cooperative for the production of phosphoric acid in an investment valued at $335 million. The project, which was to be built at Edfu, was expected to produce 500,000 metric tons (t) of phosphoric acid (P_2O_5) after startup in 2008. The project was given a Free Zone status. A large amount of the project's production was to be targeted for export to international markets (Fertilizer Week, 2005).

Mineral Fuels

Egypt was a transit corridor in the Persian Gulf and had strategic importance because of its operation of the Suez Canal by the Suez Canal Authority (SCA) and the Suez-Mediterranean (Sumed) Pipeline. The 3.1-million-barrel-per-day Sumed pipeline and the Suez Canal were two major routes for exports of oil from the Persian Gulf region to the Mediterranean. The SCA was offering a 35% discount on transit fees to liquid natural gas (LNG) tankers as well as other discounts for the largest-capacity LNG tankers as an incentive to use the Suez Canal. For 2005, the SCA reported that southbound crude petroleum and petroleum products totals increased by 11.7% compared those of 2004 and northbound crude petroleum and products totals increased by 12.5% compared with those of 2004 (U.S. Energy Information Administration, 2006§).

Natural Gas.—Most of Egypt's offshore discoveries have been of natural gas, and it was the fastest-growing mineral fuels sector in 2005. The International Egyptian Oil Company (a subsidiary of ENI-Agip of Italy) was Egypt's leading natural gas producer. The company operated in the Gulf of Suez, the Nile Delta, and the Western Desert. As of January 2005, the Government's revised estimate of proven natural gas reserves was about 1.9 trillion cubic meters, which was reported as 66 trillion cubic feet (U.S. Energy Information Administration, 2005§).

Apache Corp. announced two major natural gas discoveries—one onshore at the Mediterranean coast and the other in the Western desert close to the Qasr field. The Syrah 1X discovery in the Western desert was described as one of the region's largest, with estimated reserves of 2 trillion cubic feet of gas and 45 million barrels of condensate. Based on seismic surveys, the Syrah field would rank as the third-largest Jurassic gasfield found in the Western desert (Afrol News, 2005§).

Israel signed a $2.5 billion agreement to import natural gas from Egypt for a 15-year period. Under the contract, Egypt will sell Israel 1.7 billion cubic meters of gas from October 2006 for a total of 25 billion cubic meters. There was an option to extend the contract for an additional 5 years. Eastern Mediterranean Gas (EMG), a private Egypt-Israeli firm, would buy the natural gas from Egypt. EMG planned to build a natural gas pipeline from Egypt to the coastal city of Ashkelon, Israel (Alexander's Gas & Oil Connections, 2005b§).

Egypt's 270-kilometer (km) natural gas pipeline to Jordan was intended as the first stage of a wider regional network, the Arab Natural Gas line, which would send supplies from Egyptian gasfields to Lebanon and Syria. The second stage of the project was a 395-kilometer-long pipeline, which runs through Jordanian lands to the Syrian border. The Governments of Egypt and Syria were considering steps to implement the third phase of the project, which would extend the pipeline through Syria to the Syrian-Turkish borders. Egypt and Syria were considering an agreement to export Egyptian natural gas to Syria to supply industrial areas and electrical energy stations (Alexander's Gas & Oil Connections, 2005c§).

The Government announced that Egypt would export an LNG consignment from the Damiett LNG exporting unit to Huelva, Spain, for the first time starting in February 2005. Expansions to the Italian and the United States markets were expected to start in 2006. Damiett was one of the world's largest LNG complexes in terms of capacity. The complex, with a capacity of 7.5 billion cubic meters per year of natural gas, can produce 4.8 Mt/yr of LNG for export. The LNG shipment was purchased by Union Fenosa of Spain, which was one part of the venture that built the Damietta facility on the Mediterranean coast (Alexander's Gas & Oil Connections, 2005a§).

Eni S.p.A., as a participant in the venture that owns the Damiett facility, announced the joint venture's plans to double the capacity of the Damiett facility to cover gas supplies for the construction of a second train of 5 Mt/yr of capacity; the joint venture included BP plc, the Egyptian Natural Gas Holding Co., and Eni. Discoveries made in the Nile Delta and exploration of existing and new licenses were expected to provide enough gas supplies for the construction of the second train (Petroleum Economist, 2005).

Petroleum.—Egyptian petroleum production comes from four main areas: the Gulf of Suez (about 50%), the Western Desert, the Eastern Desert, and the Sinai Peninsula. Although the output of petroleum has declined, it was hoped that exploration activity in new areas could potentially discover sufficient oil to slow the decline. The leading producer in the Gulf of Suez was the Gulf of Suez Oil Co. (a joint venture of EGPC and Amoco Corp. of the United States). The second leading producer was Belayim Petroleum Co., which was a joint venture between International Egyptian Oil Co. and EGPC. The third ranked producer was the Suez Oil Co. (U.S. Energy Information Administration, 2005§).

The Government signed four new agreements and an amendment to an existing agreement with international oil companies for the exploration of acreage in different locations across the country. The deals, which were estimated to be worth about $110 million, were between EGPC and four groups of companies. The first agreement was signed with a group led by Devon Energy Co. of the United States and Australia's Santos Co. and included Japan's Teikoku Oil Co. The license covered exploration for petroleum in the 4,901-km^2 North Qarun block in the Gindi basin of the Western desert. The second agreement was a joint venture between Devon and Teikoku to carry out exploration in the 44-km^2 South October block in the Gulf of Suez. The third agreement was with Burren Energy plc of the United Kingdom to explore the 242-km^2 North Hurghada Marine block in the Gulf of Suez. The fourth agreement was with the joint venture of IPR Energy Red Sea, a subsidiary of the United States IPR Group, and India's ONGC Videsh. The fifth agreement amended an existing contract between IPR and EGPC. The joint venture was involved in petroleum exploration at the Alamein field and was the only concession in Egypt that operated under a cost-sharing agreement (Middle East Economic Digest, 2005b).

BP announced that it would spend $615 million during a period of 6 years on exploration and development work to further develop its two oilfields in the Gulf of Suez after the Government agreed to extend concessions for the area. The Government extended the merged concession agreement (MCA) for another 20 years, and a further 10 years on the South Gharib concession. MCA and South Gharib represented about 80% of BP's oil business in Egypt. The fields were operated by the Gulf of Suez Petroleum Co., which was a 50-50 joint venture between EGPC and BP (AFX News Ltd., 2005§).

Outlook

The Egyptian mineral fuels industry is set to continue to grow during the next 3 to 4 years, mainly as a result of the Government's recent restructuring of the energy sector following several natural gas discoveries. The Government will continue to move forward with its policy to develop the country's hydrocarbon resources. The natural gas sector is expected to expand rapidly as a result of additional output from two LNG export terminals. Although natural gas exports are likely to overtake petroleum exports in the near future, the presence of several foreign companies exploring for petroleum in offshore Egypt in 2005 suggests the possibility of further development of the petroleum sector if new discoveries are made.

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TABLE 1
EGYPT: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005
METALS						
Aluminum metal	metric tons	191,000	195,000	194,600 [4]	215,000	243,800 [4]
Copper, refined, secondary	do.	4,000	4,000	14,119 [3]	14,000	14,000
Iron and steel:						
Iron ore and concentrate		2,600 [4]	2,618 [4]	2,237 [4]	2,400 [r]	2,600
Metal:						
Pig iron		1,400	1,700	1,000 [r, 4]	1,000 [r]	1,100 [4]
Direct reduced iron		2,370	2,530	2,870 [r]	2,800 [r]	2,600
Steel, crude		3,799 [4]	4,316 [4]	4,398 [4]	4,500 [r]	5,600 [4]
Ferroalloys:						
Ferromanganese		30	30	30	30	30
Ferrosilicon		55	55	55	55	50
Manganese ore	metric tons	20,000	20,000	20,000	20,000	20,000
Titanium, ilmenite		125	125	120 [3]	120	120
INDUSTRIAL MINERALS						
Asbestos		2,000	2,000	1,000 [r]	--	--
Barite		500	500	500	500	500
Cement, hydraulic, all types		25,700	28,155 [4]	26,639 [4]	28,763 [4]	29,000
Clays:						
Bentonite		50	50	26 [4]	30	30
Fire clay		300	300	300	300	300
Kaolin	metric tons	260,000	260,000	260,000	260,000	260,000
Feldspar, crude	do.	300,000	350,000	350,000	350,000	350,000
Fluorspar	do.	500	500	500	500	500
Gypsum and anhydrite, crude		2,000	2,000	792 [4]	1,000	1,000
Lime		800	800	800	800	800
Nitropen:						
Ammonia, N content		1,801 [4]	1,839 [4]	1,790 [4]	1,652 [4]	1,640
Urea, N content		1,091 [4]	1,078 [3]	1,134 [4]	1,078 [4]	1,000
Phosphate:						
Phosphate rock		972	1,500	2,183 [3]	2,219 [4]	2,730
P_2O_5 content		293	434	630	650	800
Sodium compounds:						
Salt		2,400	2,400	1,341 [4]	1,400	1,400
Soda ash		50	50	50	50	50
Sodium sulfate	metric tons	2,500	2,500	2,500	2,500	2,500
Stone, sand and gravel:						
Basalt	thousand cubic meters	300	300	300	300	300
Dolomite		3,000	3,000	3,000	3,000	3,000
Granite, dimension stone	cubic meters	40,000	40,000	40,000	40,000	40,000
Gravel	thousand cubic meters	11,000	11,000	11,000	11,000	11,000
Limestone and similar	do.	25,000	25,000	25,000	25,000	25,000
Marble (includes alabaster) blocks	cubic meters	140,000	140,000	140,000	140,000	140,000
Sand:						
Industrial sand (glass sand)		600	600	640 [4]	650	650
Construction sand		21,000	21,000	21,000	21,000	21,000
Sandstone	thousand cubic meters	10	10	10	10	10
Sulfur:						
Elemental, byproduct	metric tons	4,500	4,500	4,500	4,500	4,500
Sulfuric acid, S content		220	220	220	220	220
Talc, soapstone, pyrophyllite	metric tons	40,000	45,529 [4]	40,000	40,000	40,000
Vermiculite	do.	12,000	12,000	12,000	12,000	12,000
MINERAL FUELS AND RELATED MATERIALS						
Coal		58	58	139 [4]	100	75
Coke		1,400	1,400	1,406 [4]	1,400	1,400

See footnotes at end of table.

TABLE 1--Continued
EGYPT: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
MINERAL FUELS AND RELATED MATERIALS--Continued						
Gas, natural:						
Gross production	million cubic meters	30,100	27,700	30,969 [4]	31,000	31,000
Dry	do.	24,550 [3]	19,605	17,680 [4]	18,000	18,000
Petroleum:						
Crude, including condensate	thousand 42-gallon barrels	277,000	221,350 [4]	221,219 [4, 5]	216,956 [r, 4, 5]	218,000
Refinery products:						
Liquefied petroleum gas	do.	5,500	6,705 [4]	6,763 [4, 7]	6,800	6,800
Gasoline and naphtha	do.	45,000	51,572 [8]	53,210 [8]	54,000	54,000
Kerosene and jet fuel	do.	16,000	19,579 [4]	19,335 [4]	20,000	20,000
Distillate fuel oil	do.	46,000	57,457 [4]	61,060 [4]	61,000	61,000
Residual fuel oil	do.	83,000	66,687 [4]	68,884 [4]	69,000	69,000
Lubricants	do.	1,800	1,960 [4]	1,855 [4]	1,900	1,900
Asphalt	do.	6,000	5,484 [4]	5,709 [4]	5,800	5,800
Unspecified[6]	do.	1,700	2,139 [4]	2,155 [4]	2,200	2,200
Total[9]	do.	205,000	211,583 [4]	218,971 [4]	220,700	221,000

[r] Revised. -- Zero.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through November 1, 2006.

[3] In addition to those listed, Egypt produced a number of commodities for which data were unavailable; these include gemstones, and some metals, such as gold and lead, which were produced from recycled material; zinc; and manufactured mineral commodities, such as carbon black and glass.

[4] Reported figure.

[5] Source: Ministry of Petroleum of the Arab Republic of Egypt.

[6] Excluding condensate.

[7] Excluding product from fields.

[8] Gasoline only.

[9] Amounts needed to complete reported refinery products totals shown.

TABLE 2
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Aluminium Co. of Egypt (Government, 80%, and private interests, 20%)	Nag Hammadi	230.
Aluminum, secondary	The Egyptian Copper Co.	Alexandria	50.
Carbon black	Alexandria Carbon Black Co. (Egyptian Holding Co. for the Chemical Industry, 49%; Inco-Bharat, 36%; Grasim Industries 15%)	do.	20.
Cement	Amirya Cement Co.	do.	2,500.
Do.	Cemex Egypt	Assiut	5,000.
Do.	Arab Swiss Engineering Co. (ASEC) (Suez Cement Co., 68.7%)	Helwan	2,800.
Do.	do.	El Minya	200.
Do.	Egyptian Cement Co. (Orascom Group, 40%; private interests, 40%; Holderbank Financiere Glaris Ltd., 20%)	70 kilometers east of Cairo	1,400.
Do.	Suez Cement Co. (Cements Français S.A., 54.2%)	Suez	3,000.
Do.	do.	Qattamiah	2,500.
Do.	do.	Tourah	2,500.
Do.	Alexandria Portland Cement Co. (Government 77%, and private interests, 23%)	El Mex	800.
Do.	National Cement Co. (Government, 77%, and private interests, 23%)	El Tabbin	4,000.
Do.	do.	Beni Suef	1,000.
Fertilizers, nitrogenous	Abu Qir Fertilizer & Chemical Industries Co. [private and public interests, 80.9%, and Egyptian General Petroleum Corp. (EGPC), 19.1%]	Abu Qir A	660 (ammonia); 760 (ammonia nitrate).
Do.	do.	Abu Qir B	300 (ammonia); 500 (urea).
Do.	do.	Abu Qir C	330 (ammonia); 600 (urea).
Do.	Société El-Nasr d Engrais et d'Industries Chemiques (Government, 100%)	Suez	146 (ammonia); 450 (nitric acid); 365 (ammonia nitrate).
Do.	do.	Talkha	330 (ammonium nitrate); 570 (ammonia and urea).
Do.	Egyptian Chemical Industries (Government, 100%)	Kima	330 (ammonia); 600 (nitric acid); 800 (ammonium nitrate).
Iron ore	Egyptian Iron and Steel Co. (Government, 100%)	El-Gedida Mine, El Bahariya	3,000.
Iron oxide	El-Nasr Mining Co. (Holding Company for Metallurgical Companies, 100%)	Mines near Sinai and Aswan	150.
Natural gas million cubic meters	Egyptian General Petroleum Corp. (EGPC) (Government, 100%)	Abu Madi	3,800.
Do. do.	do.	Badreddin-3	3,000.
Do. do.	do.	Abu Qir/Naf	1,900.
Do. do.	do.	Ras Shukheir	1,600.
Do. do.	Grupo Khalda (Repson Group, 50%; Apache Oil Co., 40%; Samsung Inc., 10%)	Khalda	24.
Petroleum, crude million 42-gallon barrels	Gulf of Suez Oil Co. [Egyptian General Petroleum Corp. (EGPC), 50%, and Amoco Inc., 50%]	October, Suez Gulf	45.
Do. do.	do.	El Morgan, Suez Gulf	27.
Do. do.	Belayim Petroleum Co. [Egyptian General Petroleum Corp. (EGPC), 50%, and International Egyptian Oil Co., 50%]	Belayim, Suez Gulf	65.
Do. do.	Suez Oil Company [Egyptian General Petroleum Corp. (EGPC), 50%; Deminex SA, 25%; Repsol S.A., 25%]	Ras Budran, Suez Gulf	15.

TABLE 2--Continued
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, pipeline	do.	Arab Petroleum Pipeline Co. (Egypt, 50%; Saudi Arabia, 15%; Kuwait, 15%; United Arab Emirates, 15%; Qatar, 5%)	Ain al-Sokhna to Sidi Kir	875.
Petroleum, refined	do.	Cairo Petroleum Refining Co. (Government, 100%)	Mostorod	42.
Do.	do.	do.	Tanta	15.
Do.	do.	Alexandria Petroleum Co. (Government, 100%)	Alexandria	42.
Do.	do.	El-Nasr Petroleum Refining Co. (Government, 100%)	Suez	36.
Do.	do.	Ameriya Petroleum Refining Co. (Government, 100%)	Ameriya	27.
Do.	do.	Suez Petroleum Processing Co. (Government, 100%)	Suez	21.
Do.	do.	Asyut Petroleum Refining Co. (Government, 100%)	Asyut	18.
Phosphate rock		El-Nasr Mining Co. (Holding Company for Metallurgical Companies, 100%)	Mines at East Sabaiya, West Sabaiya and El Qusier	1,000.
Steel		Ezz El-Dekheila Group (EZDK) (Alexandria Iron and Steel Co., Al Ezz Flat Steel Co., and Al Ezz Steel Rebars)	Plants at Alexandria, Sadat City and Suez	4,500.
Do.		Egyptian Iron and Steel Co., Hadisolb (Government, 100%)	Helwan steel plant	1,500.

THE MINERAL INDUSTRY OF EQUATORIAL GUINEA

By Philip M. Mobbs

Offshore oil and natural gas production dominated Equatorial Guinea's mineral industry. In 2005, the country ranked seventh (based on production volume) of all African crude oil producers. Mineral resources were the property of the Government. Contracts for natural gas and oil exploration and production were administered by the Ministerio de Minas, Industria y Energia. Compañia Nacional de Petróleos de Guinea Ecuatorial (GEPetrol), which was the national oil company, managed the State's interest in crude oil production operations and promoted other investment opportunities in the nation's petroleum sector. In 2005, the Government formed the Sociedad Nacional de Gas de Guinea Ecuatorial (SONAGAS, G.E.) to manage the Government's interest in natural gas-related projects, such as liquefied natural gas (LNG), liquefied petroleum gases (LPG), and methanol. The Ministerio de Minas, Industria y Energia also promoted the development of Rio Muni's mineral occurrences, which included bauxite, columbium (niobium)-tantalum, diamond, and gold (BP p.l.c., 2006, p. 8).

The Republic of Equatorial Guinea supported a Government-estimated population of about 1,138,000 (although other estimates of the country's population ranged from about 500,000 to 586,000). The total area of the country was 28,051 square kilometers, which included Bioko Island in the Gulf of Guinea and the Rio Muni enclave on the African mainland (Itam and others, 2006, p. 4; U.S. Central Intelligence Agency, 2005§[1]; U.S. Department of State, 2005§; World Bank Group, 2006§).

In 2005, the real gross domestic product (GDP) of Equatorial Guinea increased by 6% compared with a 34.2% increase in 2004. The nominal GDP was estimated to be about \$6.8 billion, and the GDP at purchasing power parity was about \$18.8 billion. Hydrocarbons accounted for more than 94% of Government revenue and about 93% of the GDP. In 2005, Government oil revenues derived from profit sharing exceeded royalties for the first time (Itam and others, 2006, p. 91, 100; International Monetary Fund, 2006§).

Most of the crude oil produced in Equatorial Guinean territorial waters was exported. Natural gas production from the Alba Field was processed on Bioko, where the liquids were stripped from the wet gas stream at Punta Europa and the dry gas piped to the methanol plant. The remaining dry natural gas not used at the methanol plant was reinjected into the Alba Field. In addition to LPG, methanol, crude oil, and natural gas, there was some production of crude construction materials, such as clay, gravel, sand, and volcanic rock, for domestic use, and gold.

Trade

The increase in international oil prices and the increase in domestic oil production resulted in a rise in the value of Equatorial Guinean petroleum exports to about \$7 billion in 2005 compared with a revised value of petroleum exports in 2004 of almost \$4.5 billion. Equatorial Guinean petroleum exports to the United States were valued at \$1.4 billion in 2005 compared with a revised \$981 million in 2004. Equatorial Guinean chemical exports (primarily methanol) to the United States dropped to \$151 million in 2005 compared with a revised figure of \$173.7 million in 2004. Mineral fuels accounted for about 90% of total Equatorial Guinean exports to the United States (Itam and others, 2006, p. 104; U.S. International Trade Commission, 2006§).

Commodity Review

Mineral Fuels

Natural Gas and Petroleum.—In 2005, exploration for petroleum continued in Equatorial Guinea. Mobil Equatorial Guinea Inc. of the United States and partners Devon OEI Operating, Inc. of the United States and GEPetrol announced the discovery of hydrocarbons on the Esmeralda prospect on Block B. Devon drilled the Venus oil prospect on Block P for partners Atlas Petroleum International Ltd. of Nigeria, DNO ASA of Norway, and Petronas Carigali Equatorial Guinea of Malaysia. Noble Energy, Inc. of the United States discovered condensate and natural gas with the O-1 exploration well on Block O. Nexen Inc. of Canada abandoned the K-2 exploration well as a dry hole.

In 2005, Alba Plant LLC of the Cayman Islands completed the expansion of the capacity of its LPG plant at Punta Europa to about 67,000 barrels per day (bbl/d) from 15,000 bbl/d. In 2004, Marathon Equatorial Guinea Production Ltd. of the Cayman Islands and GEPetrol began the construction of a \$1.4 billion 3.4-million-metric-ton-per-year-capacity LNG plant next to the LPG plant at Punta Europa. In June 2005, Mitsui & Co. Ltd. of Japan acquired 8.5% interest in the venture and Marubeni Corp. of Japan also acquired 6.5% interest. LNG production was expected to begin in 2007. BG Gas Marketing Ltd contracted to purchase the first 17 years of production (Marathon Oil Corp., 2006, p. 6, 16).

Outlook

Improved deepwater production technology, intensive exploration, and the international demand for crude oil and natural gas has transformed the Equatorial Guinean region from a marginal natural gas province to an interesting hydrocarbon prospect. In 2006, continuing negotiations with international oil companies were expected to result in the Government signing production-sharing contracts on Blocks R and S. The Government also expected to offer to investors 24 additional oil blocks in a new licensing round. The ongoing development of Equatorial Guinea's third oilfield (the Okume complex, which is located offshore Rio Muni) by Amerada Hess Equatorial Guinea, Inc. and its partners was expected to be completed in early 2007.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The planned LNG plant and the production and export of commodities associated with natural gas, such as LPG and methanol, have provided the impetus for the development of the infrastructure necessary to capture natural gas, despite the very limited local market. As a result, the volume of natural gas that would have been flared has been significantly reduced.

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Major Source of Information

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Major Publication

Ministerio de Minas y Energia, 2002, Hydrocarbons and Mining in Equatorial Guinea: Malabo, Equatorial Guinea, Ministerio de Minas y Energia, 21 p.

TABLE 1
EQUATORIAL GUINEA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand 42-gallon barrels unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005
Gold	kilograms	100 [r]	100 [r]	100 [r]	150 [r]	200
Liquefied petroleum gases		800	700	800	875	3,000
Methanol	metric tons	600,000	719,000	825,000	913,000	1,100,000
Natural gas[5]	million cubic meters	790	1,050	1,220	1,390	2,300
Petroleum, crude and condensate		74,855 [4]	90,144 [4]	102,000 [r]	137,000 [r]	144,000

[r] Revised.
[1] Estimated data are rounded to no more than three significant digits.
[2] Table includes data available through July 4, 2006.
[3] In addition to the commodities listed, Equatorial Guinea presumably produced a variety of crude construction materials (clay, gravel, and sand).
[4] Reported.
[5] Produced natural gas not used to produce methanol by Atlantic Methanol Production Co. L.L.C. or as rig or processing plant fuel was reinjected.

TABLE 2
EQUATORIAL GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(42-gallon barrels unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	kilograms	Artisanal placer operations	Aconibe, Coro, and Mongomo	500
Liquefied natural gas	metric tons	Equatorial Guinea LNG Holdings Ltd. (Marathon Oil Co., 60%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 25%; Mitsui & Co. Ltd., 8.5%; Marubeni Corp., 6.5%)	Punta Europa	3,400,000 [1]
Liquefied petroleum gas		Alba Plant LLC (Marathon Oil Co., 52%; Noble Energy Equatorial Guinea Ltd., 28%; Sociedad Nacional de Gas de Guinea Ecuatorial,[2] 20%)	Alba liquefied petroleum gas plant, Punta Europa	6,000,000 [3]
Methanol	metric tons	Atlantic Methanol Production Co. L.L.C. (Marathon Equatorial Guinea Methanol Ltd., 45%; Samedan Methanol, 45%; Sociedad Nacional de Gas de Guinea Ecuatorial, 10%)	Punta Europa	1,100,000
Natural gas	million cubic meters	Joint venture of Marathon Oil Co., 63%; Noble Energy Equatorial Guinea Ltd., 34%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 3%	Alba Field, Alba Block	2,300 [4]
Petroleum:				
Crude		Joint venture of Amerada Hess Equatorial Guinea, Inc., 80.75%; Energy Africa Equatorial Guinea Ltd., 14.25%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 5%	Ceiba Field, Block G	11,500,000
Do.		Joint venture of Mobil Equatorial Guinea Inc., 71.25%; Devon O.E.I. Operating Inc., 23,75%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 5%	Zafiro Field, Block B	102,000,000
Crude and condensate		Joint venture of Marathon Oil Co., 63%; Samedan of North Africa Inc., 34%; Compañia Nacional de Petróleos de Guinea Ecuatorial, 3%	Alba Field, Alba Block	16,800,000

[1] Under construction. Processing train 1 is expected to open in late 2007.

[2] In 2005, the Government's interest was transferred to Sociedad Nacional de Gas de Guinea Ecuatorial from Guinea Ecuatorial Oil and Gas Marketing Ltda.

[3] Expansion completed in 2005.

[4] About 60% of natural gas produced from the Alba Field is reinjected.

THE MINERAL INDUSTRY OF ERITREA

By Thomas R. Yager

The East African country of Eritrea, which became independent from Ethiopia in 1993, produced a variety of minerals and mineral products. Such industrial minerals and construction materials as basalt, cement, common clay, coral, granite, gravel, gypsum, kaolin, lime, limestone, marble, pumice, quartz, salt, sand, and silica sand were produced (table 1). Artisanal miners also produced small amounts of gold. The country also has deposits of barite, chromium, copper, feldspar, iron ore, lead, magnesium, nickel, potash, silver, talc, and zinc.

In September 2004, the Government ordered a halt to all mineral exploration activity in Eritrea while it reviewed the Mining Act. The Government suspension was lifted in January 2005. The Government increased the maximum possible equity interest that it may hold in a project through an option agreement to 30% from 20% (Hadgu, 2005).

In October 2005, Nevsun Resources Ltd. started a $1.4 million exploration program at its AK, Augaro, and Bisha properties in western Eritrea. In February, Nevsun initiated a feasibility study on the development of the Bisha copper-gold-silver-zinc deposit; the study was expected to be completed near the end of the second quarter of 2006. If the feasibility study were to yield favorable results, gold production could start in 2008 (African Mining, 2005; Hadgu, 2005).

Nevsun planned to mine 2 million metric tons per year (Mt/yr) of ore from Bisha during the first 9 years of the mine's life; ore production was expected to increase to 2.51 Mt/yr in the 10th year. In the first 2 years, Nevsun planned to produce 13,200 kilograms per year (kg/yr) of gold and 32,200 kg/yr of silver; ore would be mined from the oxide zone of the deposit. In the next 3 years, the company planned to produce about 70,000 metric tons per year (t/yr) of copper, 840 kg/yr of gold, and 52,600 kg/yr of silver; ore would be mined from the supergene zone of the deposit. Starting in the sixth year, Nevsun planned to produce 150,000 t/yr of zinc and 18,000 t/yr of copper; ore would be mined from the primary copper and zinc zones of the deposit (Yu and others, 2005, p. 1.4, 16.19-16.20, 18.22, 18.41-18.42).

Sub-Sahara Resources NL of Australia held the Adi Nefas, the Debarwa, and the Medrizien exploration licenses near Asmara; these licenses composed the company's Asmara Project. In 2005, Sub-Sahara and its joint-venture partner Sunridge Gold Corp. of Canada conducted drilling at the Adi Nefas Gossan copper-gold-zinc deposit and at the Debarwa copper-gold deposit. The companies began a conceptual mine study on Debarwa that was expected to be completed by February 2006. Exploration was also planned at the Emba Derho copper-zinc deposit in the Medrizien license. Sub-Sahara and its joint-venture partner Dragon Mining NL of Australia began diamond drilling at the Zara project in northwestern Eritrea in August 2005 (African Mining, 2005; Sub-Sahara Resources NL, 2005).

In 2005, Sanu Resources Ltd. of Canada explored at properties in western Eritrea that included the Dieba River, the Fanco, the Guluj, the Kerkebet, and the Mogoraib. The company relinquished the Kerkebet West license in July. Sanu spent $1.6 million on exploration for gold in Eritrea in 2005. Minières du Nord Ltée. of Canada initiated a new exploration program at the Harab Suit exploration license in December (Minières du Nord Ltée., 2005; Sanu Resources Ltd., 2006, p. 2, 14, 16).

Granite was produced near Arato, Geleb, Korbaria, and Tukul, and marble, at Debri and Kertse-Komte. From 2001 to 2005, granite production increased to 350,280 metric tons (t) from 145,193 t. In 2005, marble production declined to 36,046 square meters (m^2) from 780,733 m^2 in 2004 but was still more than double the output of 2001. Eritrea also produced kaolin and other clays; about 36.2 million bricks were produced in 2005 compared with 29.3 million in 2004 (Department of Mines, 2006, p. 11; Alem Kibreab, Director General, Department of Mines, written commun., June 27, 2006).

Outlook

Eritrea's mineral industry could experience substantial growth in the near future because of the development of metals deposits; the continuation of peace with Ethiopia and favorable global market conditions are necessary conditions for successful development. Demand for construction materials could increase if Bisha and other metals deposits are developed.

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TABLE 1
ERITREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
Basalt		161,759	148,424	111,677	499,349	184,027
Cement[e]		45,000	45,000	45,000	45,000	45,000
Clays:						
Common		282,518	225,504	218,539	173,412	3,740,411
Kaolin		588	250	281	101	1,037
Coral		38,596	49,297	70,000 [e]	95,131	91,348
Gold	kilograms	107	--	9	33	25
Granite		145,193	150,053	140,418	192,803	350,280
Gravel		339,692	220,928	340,125	169,254	219,837
Gypsum		985	504	1,284	500	101
Laterite		3,575	5,200	832	1,240	44
Lime		42,610	47,406	5,400	2,915	22,423
Limestone[e, 3]		2,800	2,900	2,900	2,900	2,900
Marble blocks	square meters	17,656	12,851	1,777,814	780,733	36,046
Pumice		195	212	50	439	56
Quartz		350	215	370	4,496	103
Salt		77,853	116,268	5,241	3,075	6,300
Sand	thousand metric tons	685	605	788	611	1,163
Silica sand		--	36	40 [e]	46	50 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits. -- Zero.

[1] Table includes data available through July 13, 2006.

[2] In addition to the commodities listed, feldspar and talc reportedly were produced, but information is inadequate to estimate output.

[3] For other than cement.

TABLE 2
ERITREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement	metric tons	Eritrea Cement Works	Massawa	45,000 cement; 45,000 clinker.
Petroleum products	thousand barrels	Petroleum Corp. of Eritrea[1]	Assab	5,320.

[1] Has not operated since 1997.

TABLE 3
ERITREA: MINERAL RESOURCES IN 2005

Deposit	Operating companies	Tonnage[1]	Grade[1]	Mineral content[1]
Bisha:				
Primary Zinc Zone	Nevsun Resources Ltd.	13.6 Mt	8.8% Zn, 1% Cu, 0.7 Au, 57 g/t Ag	1.2 Mt Zn, 130,000 t Cu, 770 t Ag, and 10 t Au.
Supergene Copper Zone	do.	7.83 Mt	3.8% Cu, 0.7 g/t Au, 30.7 g/t Ag	300,000 t Cu, 240 t Ag, and 6 t Au.
Oxide Zone	do.	5.11 Mt	7.1 g/t Au, 30.4 g/t Ag	36 t Au and 155 t Ag.
Primary Copper Zone	do.	2.1 Mt	3.1% Zn, 0.8% Cu, 0.7 g/t Au, 32.3 g/t Ag	66,000 t Zn, 18,000 t Cu, and 68 t Ag.
Emba Dero[2]	Sub-Sahara Resources NL, 48%; Sunridge Gold Corp., 40%; Africa Wide Resources Ltd., 12%	2.59 Mt	2.36% Zn, 0.39% Cu, 0.1 g/t Au, 4.5 g/t Ag	61,000 t Zn, 10,000 t Cu, and 12 t Ag.
Debarwa:[2, 3]				
Main and Footwall Zones	do.	1.65 Mt	5.1% Cu, 1.4 g/t Au	84,000 t Cu and 2 t Au.
Leached Zone	do.	0.47 Mt	7.07 g/t Au	3 t Au.
Gupo Gold (Adi Nefas Doop)[4]	do.	1.9 Mt	2.99 g/t Au	6 t Au.
Adi Nefas Gossan[4]	do.	1.4 Mt	9.3% Zn, 1.4% Cu, 1.6% Pb, 4.28 g/t Au, 160 g/t Ag	130,000 t Zn, 20,000 t Cu, 22,000 t Pb, 6 t Au, and 220 t Ag.

[1] Abbreviations used for units of measure in this table include the following: g/t--grams per metric ton; Mt--million metric tons; t--metric tons. Abbreviations used for commodities in this table include the following: Ag--silver; Au--gold; Cu--copper; Pb--lead; Zn--zinc.

[2] Sub-Sahara indicated that these resource estimates are not in compliance with the standards set by the Australasian Joint Ore Reserves Committee; readers are advised to treat these estimates with caution.

[3] Sub-Sahara Resources NL reported that additional resources at Debarwa were 1.3 Mt; grades are not available.

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THE MINERAL INDUSTRY OF ETHIOPIA

By Thomas R. Yager

Ethiopia has been a producer of gold, silver, and tantalite, and such industrial minerals as brick clay, diatomite, feldspar, gemstones, granite, gypsum and anhydrite, kaolin, limestone, marble, pumice, quartz, salt, sand, scoria, soda ash, and talc. The country has also produced cement, lignite, lime, and steel (table 1). In 2005, Ethiopia's main mineral export was gold. Other metal deposits include iron ore, manganese, nickel, and platinum. Other industrial mineral deposits include apatite, bentonite, potash, and sulfur.

In 2005, Ethiopia's nominal gross domestic product (GDP) based on purchasing power parity amounted to about $60.1 billion. The real GDP grew by 8.7% in 2005 compared with 12.3% in 2004. The mining industry was not a significant factor in the economy (International Monetary Fund, 2006, p. 184; 2006§[1]).

Government Policies and Programs

The illegal mining of dimension stone, gemstones, gold, and salt reportedly contributed to widespread environmental damage in Ethiopia that included deforestation, soil erosion, and water pollution. The Government planned to organize artisanal miners into about 200 cooperatives to reduce illegal mining activities (Gebre-Selassie, 2005).

Most of the gold produced by artisanal and small-scale miners was smuggled out of the country. To alleviate this problem, the Government enacted regulations in 2005 that allowed gold traders to buy gold from artisanal and small-scale miners and sell it to the National Bank of Ethiopia at market prices (Gebre-Selassie, 2005; Bekele, 2006).

Commodity Review

Metals

Gold.—Ethiopia produced an estimated 3,900 kilograms (kg) of gold in fiscal year 2004-05 compared with 3,443 kg in fiscal year 2003-04. National gold exports amounted to 4,200 kg at a value of $90 million (Bekele, 2006).

Midroc Gold Mine plc (a subsidiary of Midroc Ethiopia Group) operated the Lega Dembi Mine in southern Ethiopia; other gold mines that operated in southern Ethiopia included the Adola and Sakaro. Midroc produced an average of 3,500 kilograms per year of gold at Lega Dembi; production amounted to 3,600 kg in 2005. The company planned to increase output by reprocessing tailings (Bekele, 2006).

Midroc also explored for gold at concessions near the Lega Dembi Mine. From November 2004 to June 2005, Sheba Exploration (UK) plc conducted a trenching program at the Amora Hill prospect on the Mereto concession (African Mining, 2005).

Platinum-Group Metals.—At the end of 2004, Golden Prospect plc of the United Kingdom held three platinum and gold exploration licenses in Oromia Regional State. In early 2005, the Government approved Golden Prospect's acquisition of a 51% interest in a small-scale platinum and gold mining operation and two exploration licenses in the same area. The company planned to expand the mining operation, upgrade the processing plant, and conduct a resource assessment (Golden Prospect plc, 2005, p. 7).

Industrial Minerals

Cement.—Ethiopia had four cement plants that produced about 1.57 million metric tons (Mt) of cement in fiscal year 2004-05 compared with nearly 1.32 Mt in fiscal year 2003-04 and 1.13 Mt in fiscal year 2002-03. The value of cement production amounted to $58.7 million in fiscal year 2003-04 (Gebre Egziabher Mekonen, Mineral Operations Department Head, Ethiopia Ministry of Mines and Energy, written commun., February 2, 2006).

Mugher Cement Enterprise operated cement plants at Addis Ababa, Dire Dawa, and Mugher. In fiscal year 2004-05, Mugher produced 856,000 metric tons (t) of cement; the company planned to increase production to 876,000 t in fiscal year 2005-06. Messebo Building Materials Production Share Company operated a cement plant at Mekele in Tigray Regional State. In fiscal year 2004-05, Messebo produced more than 712,000 t of cement; the company planned to produce 800,000 t in fiscal year 2005-06 (Walta Information Center, 2005; Alemayehu, 2006).

By the end of 2005, Messebo and Mugher were reportedly producing at their full capacity of 1.7 million metric tons per year (Mt/yr). In spite of the recent increases in production, Ethiopia experienced shortages of cement in 2005; the cement industry was producing at full capacity and demand was estimated to be 2.4 Mt/yr. The Gilgel Gibe hydroelectric project and new residential construction each consumed between 10% and 11% of national cement production (Kiros, 2005).

Mugher planned to build a new cement plant with a capacity of between 1.46 and 1.64 Mt/yr to alleviate domestic cement shortages; Messebo also planned to expand its capacity. Fulaz Petroleum planned to build a new cement plant at Dire Dawa with a capacity of 440,000 metric tons per year (t/yr). The plant was expected to be completed by 2008 at a cost of $107 million (Ethiopian Reporter, 2005; Kiros, 2005).

Gemstones.—Artisanal and small-scale miners produced a variety of gemstones. Opal was found at Mezezo in Amhara Regional State; garnet, at Harshitmi; sapphire, at Bonga; aquamarine, at Chembi, Kenticha, and Kilkile; emerald, at Chembi; and peridot, at Chewbet, Gofa Gedo, Mega, Megado, and Tassy. Other gemstones produced included amazonite, amethyst, quartz, and tourmaline. In fiscal year 2003-04, the production of opal increased to 370 kg from 187 kg in fiscal year 2002-03; and garnet, to 11 kg from 6 kg (Gebre

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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Salt.—Afar Salt plc, Bashenfer Salt plc, and Geo Action plc mined salt at Afdera Lake in northeastern Ethiopia; artisanal miners also produced salt. In fiscal year 2003-04, national salt production increased to 200,000 t from about 145,000 t in fiscal year 2002-03 in spite of the poor condition of the Sodome Meda-Afdera gravel road. Since 2000, Ethiopia's salt production has nearly quadrupled.

Stone, Crushed and Dimension.—Ashraf Regional Group of Sudan planned to produce basalt, granite, limestone, marble, and sandstone in Amhara and Oromia Regional States. In Amhara Regional State, the company expected to produce 65,700 t/yr of sandstone, 59,100 t/yr of granite, 591,820 square meters per year (m^2/yr) of sandstone slabs and tiles, and 394,180 m^2/yr of granite slabs and tiles at Beko Abo. At Avola, production was expected to be 800,000 t/yr of basalt, and at Menta Woha, 54,000 t/yr of marble. In Oromia Regional State, Ashraf planned to produce more than 1.45 million square meters per year of sandstone slabs and tiles at Keteba and 54,000 t/yr of limestone at Tiffi. The Government awarded a mining license to Ashraf in September 2005 (Ethiopian Ministry of Mines and Energy, 2005a).

Fanous Construction plc planned to produce about 2.2 Mt/yr of basalt aggregate at Arbessa in Addis Ababa Regional State. In December 2005, the Government awarded a 10-year mining license to Fanous (Ethiopian Ministry of Mines and Energy, 2005b).

Mineral Fuels

At the end of 2005, Ethiopia was totally dependent upon imports to meet its demand for petroleum. Natural gas resources in the Calub Field in the Ogaden Basin remained undeveloped. Small amounts of lignite were reportedly produced.

Petronas Carigali Overseas Shd. Bhd. of Malaysia explored for crude petroleum at Block G in the Gambella Basin. In August 2005, the company was awarded three concessions in the Ogaden Basin. Wal-Wal and Warder covered 36,796 square kilometers (km^2); Kelafo, 30,611 km^2; and Genale, 25,571 km^2. Petronas planned to spend $15 million on exploration in the Ogaden Basin starting in 2006 (Bekele, 2005b).

In October 2005, Pexco Exploration of Malaysia was awarded a concession that covered 29,865 km^2 at Abred and Ferfer in the Ogaden Basin. Pexco planned to spend $5 million on exploration over 4 years beginning in 2006. In October, Afar Exploration Company of the United States was negotiating with the Government over a concession and production-sharing agreement that covered 18,000 km^2 in northern Afar Regional State (Bekele, 2005a, b).

Infrastructure

The state-owned Ethiopian Electric Power Corp. (EEPCO) generated most of the country's electricity from hydroelectric plants. EEPCO's plants had a capacity of 750 megawatts (MW) in 2005; the company planned to increase capacity to 2,900 MW by 2010. In July 2005, Salini Construttori S.P.A. signed an agreement with EEPCO to build the 460-MW Beles hydropower project. Beles was expected to be completed in 2008 at a cost of $619 million. Other hydropower projects under development included Gilgel Gibe II and Tekeze with capacities of 425 MW and 300 MW, respectively (Mekuria, 2005).

In 2004, Ethiopia's transportation network comprised nearly 36,500 km of roads; the Ethiopian segment of the Addis Ababa-Djibouti railroad was 781 km. The road network was expected to increase to about 104,200 km in 2015.

Outlook

The low level of mineral exploration in Ethiopia was likely to constrain production increases for columbium (niobium) and tantalum, gold, and silver and the development of such other metals as iron ore, manganese, and nickel. Production of industrial minerals faces a variety of constraints. In recent years, domestic output of kaolin and sulfuric acid has been inhibited by limited domestic demand; caustic soda, by import competition and shortages of lime needed as raw material; and silica sand, by the capacity of the country's only glass and bottle factory (Ethiopia Ministry of Mines and Energy, 2002, p. 6, 10, 14, 15). The production of cement and other building materials was likely to increase because of rapid growth in the construction sector and planned capacity-expansion programs.

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TABLE 1
ETHIOPIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001[e]	2002[e]	2003	2004	2005[e]
Cement, hydraulic		900,000 [4]	900,000 [4]	1,130,066 [r]	1,315,934 [r]	1,568,000 [4]
Clays:[5]						
Brick		200,000	170,000	140,000	106,609 [4]	125,000
Kaolin, China clay		1,800	3,534 [4]	3,088	4,251 [r]	4,300
Other clay	cubic meters	25,000	27,000	28,000 [e]	28,000 [e]	28,000
Columbium (niobium) and tantalum:						
Columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	46,900 [4]	55,000 [4]	58,350 [r]	70,730 [r]	71,000
Nb content	do.	4,700	5,500	5,800 [e]	7,100 [e]	7,100
Ta content	do.	28,000	33,000	35,000 [e]	45,000 [r]	45,000
Diatomite		300 [r]	500 [r]	700 [r]	2,000 [r]	2,000
Feldspar		250 [r]	230 [r]	208 [r]	361 [r]	370
Gemstones:[6]						
Amethyst	kilograms	NA	NA	NA	1	1
Aquamarine	do.	NA	NA	NA	2	2
Emerald	do.	NA	NA	--	1	1
Garnet	do.	NA	NA	6	11	11
Opal	do.	NA	NA	187	370	370
Peridot	do.	NA	NA	1	--	--
Quartz	do.	NA	NA	31	469	470
Sapphire	do.	NA	NA	8	1	1
Tourmaline	do.	NA	NA	5	5 [e]	5
Gold, mine output, Au content[6]	do.	3,862 [4]	3,670 [4]	3,875	3,443	3,900
Gypsum and anhydrite, crude		50,500 [4]	22,500 [4]	48,058 [4]	51,200	52,000
Lime		4,100	4,500	3,400 [r]	3,800 [r]	3,800
Quartz		NA	NA	115	170	170
Salt, rock		90,000	120,000	145,070 [r]	200,000 [r]	200,000
Silver, mine output, Au content	kilograms	3,545 [4]	900 [4]	999	1,133	1,200
Soda ash, natural		7,543 [4]	3,843 [4]	4,377	6,444	6,500
Stone, sand and gravel:[5]						
Basalt		NA	NA	592,000	17,800	21,000
Dolomite		NA	NA	1,600 [r]	2,250 [r]	2,300
Granite	square meters	17,000	10,000	4,087	19,499	23,000
Ignimbrite	cubic meters	NA	NA	229,013	229,277	270,000
Limestone:						
Slab/tiles	square meters	NA	NA	6,420	3,078	3,700
Other	thousand metric tons	1,600 [r]	2,000 [r]	2,290 [r]	2,380 [r]	2,800
Marble:						
Slab/tiles	square meters	110,000	110,000	106,241	122,008	145,000
Terrazzo	do.	NA	NA	144,045	114,446	140,000
Block and other		14,000	14,000	16,200	14,600	16,000
Pumice[5]		180,000	210,000	218,676 [r]	270,994	320,000
Rhyolite		NA	NA	34,000	20,900	25,000
Sand[7]	thousand metric tons	2,000	2,200	2,300	2,300	2,700
Sandstone	do.	NA	NA	318 [r]	1,221	1,500
Scoria[e]		310,000	340,000	350,000	350,000	420,000
Silica sand		6,000	6,000	5,400 [r]	4,550 [r]	4,600

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through April 10, 2006.

[2] Data are for the Ethiopian calendar year ending July 7 of the year listed.

[3] In addition to the commodities listed, some lignite, crude and semimanufactured steel, sulfuric acid, and talc reportedly were produced, and platinum was reportedly contained in gold ingots from the Lega Dembi Mine, but information is inadequate to estimate output.

[4] Reported figure.

[5] When reported as volume or pieces, conversions to metric tons are estimated.

[6] Does not include smuggled artisanal production.

[7] May include gravel.

TABLE 2
ETHIOPIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Caustic soda		Abiyata Soda Ash Enterprise (Government-owned)	Plant at Ziway	10,000.
Cement		Messebo Building Materials Production Share Company (Government-owned)	Plant at Mekele	800,000 cement.
Do.		Mugher Cement Enterprise (Government-owned)	Plant at Mugher	720,000 cement; 620,000 clinker.
Do.		do.	Plant at Addis Ababa	125,000 cement; 112,000 clinker.
Do.		do.	Plant at Dire Dawa	32,000 cement; 24,000 clinker.
Columbium (niobium) and tantalum	kilograms	Ethiopian Mineral Resources Development Enterprise (EMRDE) [Government-owned]	Kenticha Mine near Borena	112,000 tantalum.[e]
Glass		Addis Ababa Bottle and Glass Share Company	Plant at Addis Ababa	8,000.
Gold		Midroc Gold Mine plc (subsidiary of Midroc Ethiopia Group)	Mine at Lega Dembi	1,500,000 ore processing.
Do.	kilograms	do.	do.	4,000 gold.
Kaolin		Ethiopian Mineral Resources Development Enterprise	Mine at Bamba Wuha	15,000.
Marble		Ethiopian Marble Industries	Mines at Harar and various sites in western Ethiopia	NA.
Do.		National Mining Corp. (subsidiary of Midroc Ethiopia Ltd.)	Mine at Mugher	NA.
Do.		Saba Stones	Mine in Tigre Province	NA.
Salt		Afar Salt plc, Bashenfer Salt plc, and Geo Action plc	Mines at Afdera Lake	NA.
Soda ash		Abiyata Soda Ash Enterprise	Mine at Lake Abiyata	20,000.[e]
Steel:				
Crude		Ethiopia Iron and Steel Factory	Plant at Akaki	NA.
Semimanufactured		do.	do.	12,000.
Do.		Zuquala Steel Rolling Mill Enterprise (Government-owned)	Plant at Debre Zeit	100,000.
Galvanized		Akaki Metal Products Factory	Plant at Akaki	NA.
Sulfuric acid		Melkasa Aluminum Sulfate and Sulfuric Acid Factory	Plant at Melkasa	NA.

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

TABLE 3
ETHIOPIA: MINERAL RESOURCES IN 2005[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Diatomite	Lakes Region, Shewa and Arsi Provinces	NA	NA	85 Mt.
Dolomite	Galleti	NA	NA	1.4 Mt.
Do.	Hula-Kuni	NA	NA	250,000 t.
Feldspar	Kenticha	1.14 Mt	40% feldspar	500,000 t.
Do.	Babile-Bombas	0.3 Mt	50% feldspar	150,000 t.
Gold	Lega Dembi	NA	NA	83,000 kg.
Do.	Adola	NA	NA	4,500 kg.
Gypsum	Sodoble	NA	NA	56 Mt.
Do.	Adigudom	NA	NA	400,000 t.
Kaolin	Bombowha	1 Mt	30% kaolin	300,000 t.
Do.	Kombelcha	0.96 Mt	31% kaolin	300,000 t.
Limestone	Mossobo	NA	NA	69.5 Mt.
Do.	Mugher	NA	NA	50 Mt.
Do.	Dire Dawa	NA	NA	46 Mt.
Marble	Mora	NA	NA	46.5 Mt.
Do.	Baruda	NA	NA	13.6 Mt.
Natural gas	Calub	25 billion cubic meters	NA	NA.
Peridot	Bulgendo	NA	NA	2,457 kg.
Salt	Denkali depression	NA	NA	3,000 Mt.
Do.	Lake Afdera	NA	NA	290 Mt.
Silica sand	Mu her p	NA	NA	3.4 Mt.
Soda ash	Lakes Abiyata, Chiltu, and Shala	NA	1.1% to 1.9% Na_2CO_3	460 Mt.
Talc	Anno	NA	NA	120,000 t.

NA Not available.

[1] Abbreviations used in this table for commodities include the following: Na_2CO_3--sodium carbonate (soda ash). Abbreviations used in this table for units of measurement include the following: kg--kilograms; Mt--million metric tons; t--metric tons.

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THE MINERAL INDUSTRY OF GABON

By Omayra Bermúdez-Lugo

The equatorial African Republic of Gabon is located on the Atlantic Ocean coast between Congo (Brazzaville) to the south and Cameroon and Equatorial Guinea to the north. In 2005, Gabon's mineral industry was dominated by crude petroleum and manganese production. Nonfuel mineral commodities produced in the country included cement, diamond, and gold. Other identified mineral resources were columbium (niobium), iron ore, and phosphate rock. The Ministère des Mines, de l'Energie, du Pétrole et des Ressources Hydrauliques was responsible for the administration of the mineral sector.

Commodity Review

Metals

Columbium (Niobium) and Tantalum.—Ridge Mining plc of the United Kingdom (formerly known as Cliff Mining plc; the name was changed in May 2004) relinquished its interest in the Mabounie phosphate and columbium (niobium)-bearing carbonatite deposit in central Gabon. Ridge reported that its investment in the Mabounie project was no longer considered to have any value to the company following the shutdown of its columbium (niobium) operations in the Netherlands (Ridge Mining plc, 2006, p. 24, 30; Ridge Mining plc, 2005§[1]).

Gold.—In July, SearchGold Resources Inc. of Canada signed a $4.2 million joint-venture agreement with Managem S.A. (the mining division of Moroccan-based Groupe Ona) to explore and develop the Bakoudou gold project in southeastern Gabon. Managem will be the project operator (SearchGold Resources Inc., 2005a, b).

Iron Ore.—Brazil's Companhia Vale do Rio Doce (CVRD), through its Gabonese subsidiary Compagnie Minière Trois Rivière, conducted a technical and economic feasibility study of the Belinga iron ore deposit in northeastern Gabon. CVRD headed a consortium formed by Eramet Group of France, Metallurgical Equipment Importation and Exportation Company (CMIEC) of China, and Sinosteel Gabon Pty Ltd (a subsidiary of Sinosteel Corporation of China). CVRD planned to invest $15 million in the Belinga project in 2006 (Companhia Vale do Rio Doce, 2006§).

Manganese.—Manganese ore was produced at the Moanda Mine in Franceville and shipped 600 kilometers (km) via the Transgabonais railway to the Owenda minerals port in Libreville. Manganese ore production at Moanda, including sinter, increased to about 2.9 million metric tons (Mt) in 2005 from 2.46 Mt in 2004. Compagnie Miniere de l'Ogooue S.A. (Comilog), which was a 67% owned subsidiary of Eramet Group, owned the Moanda Mine. Comilog planned to increase production capacity to 3 million metric tons per year (Mt/yr) by the end of 2006 (Eramet Group, 2006).

In 2005, CVRD earmarked $33 million to explore for manganese in the Franceville and the Okondja regions of southeastern Gabon. The company reported that it had opened a 5-metric-ton-per-hour manganese pilot plant in Franceville and was in the process of evaluating a technical and economic feasibility study for the development of the manganese deposits at Franceville and Okondja (Companhia Vale do Rio Doce, 2006§).

Industrial Minerals

Diamond.—SouthernEra Diamonds Inc. of Canada (formerly known as SouthernEra Resources Ltd.; the name was changed in July 2004) announced the discovery of six additional kimberlite occurrences at its Makongonio exploration project in southern Gabon in addition to the discovery of the first known kimberlite pipe in the country. The company also reported the discovery of a kimberlite dike at its Sud diamond exploration permit, which is located about 60 km northeast of Makongonio, and of two additional kimberlite dikes within its Kango permit. The company's 2006 exploration program will focus on evaluating the economic diamond potential of these discoveries (SouthernEra Diamonds Inc., 2006, p. 14).

Motapa Diamonds Inc. held 100% interest in the Lebiri diamond project in east-central Gabon. After conducting reconnaissance sampling at Lebiri in 2004, the company focused on an airborne magnetic survey of selected high-interest areas in 2005. The company planned to continue to evaluate potential kimberlite targets in 2006 (Motapa Diamonds Inc., 2005a, b).

Mineral Fuels

Petroleum.—Total Gabon S.A. (a joint venture between the Government of Gabon and Total S.A. of France) produced about 36 million barrels of petroleum from its Gabonese oilfields in 2005 (Total S.A., 2006b). The company was the operator of the Anguille, the Gonelle, and the Torpille (100% each), the Avocette (57.5%), and the Baudroie Nord (50%) oilfields and shared a 47.5% interest in the Rabi Kounga oilfield. Total also held a 100% interest in the Rabi pipeline and a 43.84% interest in the Port Gentil petroleum refinery (Total S.A., 2006a, p. 33-35, 51, 54, 64).

Marathon Oil Corporation of the United States operated the Tchatamba Marin, the Tchatamba West, and the Tchatamba South (56% each) oilfields offshore Gabon. In 2005, the company produced about 12,100 barrels per day (bbl/d) of petroleum from these three oilfields (Marathon Oil Corporation, 2006, p. 6).

Vaalco Energy Inc. held a 30.35% interest in the Etame Marine Block offshore Gabon, which hosts the Avouma, the Ebouri, and the Etame oilfields. The company produced about 18,000 bbl/d of petroleum from the Etame oilfield. The Avouma oilfield was expected to go into production at the end of 2006 and to produce about 6,600 bbl/d of petroleum (Vaalco Energy Inc., 2006§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

PanAfrican Energy Gabon (a subsidiary of PanOcean Energy Corporation) operated three onshore oilfields—the Obangue and the Tsiengui (92.5% interest each), and the Remboue (92%)—and held a 31.4% interest in the Etame Marin oilfield offshore. In 2005, the company produced a total of about 9,300 bbl/d of petroleum from the four oilfields (PanOcean Energy Corporation, 2006§).

Uranium.—In December, Motapa Diamonds announced that the Government had granted the company the exclusive right to explore for uranium in east-central Gabon in an area located about 100 km from the Mounana uranium district. The permit included the right to explore for gold and manganese in addition to uranium (Motapa Diamonds Inc., 2005c).

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TABLE 1

GABON: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
Cement, hydraulic[e, 3]	metric tons	240,000 [r, 4]	257,000 [r, 4]	260,000 [r]	260,000 [r]	260,000
Clinker[e]	do.	300,000	350,000	350,000	350,000	350,000
Diamond, gem and industrial[e]	carats	500	500	500	500	500
Gold, mine output, Au content[e, 5]	kilograms	70	70	70	300 [r]	300
Manganese:						
Metallurgical-grade ore, gross weight (50% to 53% Mn)	thousand metric tons	1,758	1,816	1,950 [e]	2,400	2,800
Pellets, battery- and chemical-grade, gross weight (82% to 85% MnO_2)	do.	33	40	50 [e]	60	59
Total	do.	1,791	1,856	2,000	2,460 [4]	2,859 [4]
Natural gas, gross[e]	million cubic meters	99	80	79	80	80
Petroleum:						
Crude	thousand 42-gallon barrels	98,550	91,980	87,965	87,235 [4]	85,469 [4]
Refinery products	do.	6,672	6,500	6,500 [e]	6,300	6,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through May 26, 2006.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is also produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

[3] Includes cement produced from imported clinker.

[4] Reported figure.

[5] Gold production figures do not include production smuggled out of the country, which, in recent years, was estimated to exceed 400 kilograms per year.

TABLE 2
GABON: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and and major equity owners	Location of main facilities	Annual capacity
Cement		Ciments du Gabon (Heidelberg Cement Group, through Scancem International ANS)	Cement-grinding plant at Owendo, south of Libreville	240,000
Do.		do.	Cement-grinding plant at Franceville, southeastern Gabon	170,000
Clinker		do.	Clinker plant at N'Toum, 40 kilometers east of Libreville	300,000
Gold	kilograms	Artisanal Miners	Eteke region	300 to 700
Manganese		Compagnie Miniere de l'Ogooue S.A. (Comilog) (Eramet International of France, 67%; Government, 25%; other, 8%)	Open pit mine at Moanda	2,500,000 [1]
Petroleum:				
Crude	thousand 42-gallon barrels	Total Gabon S.A., 58%; Government, 25%; other, 17%	Anguille, Avocette, Baudroie, Gonelle, Torpille, and Rabi Kounga oilfields	NA
Do.	do.	PanAfrican Energy, 33.90%; Vaalco Gabon Inc., 30.35%; Sasol Petroleum, 30%; Sojitz Corporation, 3.225%; Petro Energy, 2.525%	Etame Marine Block, offshore: Avouma oilfield (under development)	2,400 [2]
Do.	do.	do.	Ebouri oilfield (exploration stage)	--
Do.	do.	do.	Etame oilfield	6,570
Do.	do.	Marathon Oil Corporation, 56%; Tullow Oil plc, 25%; Devon Energy Corporation (% ownership unknown)	Tchatamba Marin oilfield	NA
Do.	do.	do.	Tchatamba West oilfield	NA
Do.	do.	do.	Tchatamba South oilfield	NA
Do.	do.	PanOcean Energy Corporation, operator, 92.5%	Obangue oilfield	1,800
Do.	do.	do.	Tsiengui oilfield	1,800
Do.	do.	PanOcean Energy Corporation, operator, 90%	Remboue oilfield	NA
Do.	do.	PanOcean Energy Corporation, 31.4%	Etame Marin oilfield	2,300
Refinery products	do.	Total Gabon S.A., 58%; Government, 25%; other, 17%	Port Gentil	8,800

NA Not available. -- Zero.

[1] According to Eramet International, production of manganese ore and sinter in 2005 exceeded nameplate capacity owing to ongoing work aimed at increasing production capacity at the Moanda Mine to 3 million metric tons by 2006.

[2] According to Vaalco Energy Inc., the Avouma oilfield was under development in 2005 with a platform scheduled to be set in July 2006 and first petroleum expected by December 2006.

THE MINERAL INDUSTRIES OF THE GAMBIA, GUINEA-BISSAU, AND SENEGAL

By Omayra Bermúdez-Lugo

THE GAMBIA

The Gambia is a West African country that is bounded to the west by the Atlantic Ocean and to the east, north, and south by Senegal. The country's estimated 1.6 million inhabitants share a total land area of about 10,000 square kilometers (km^2). Mining, which was limited to the production of clay, laterite, sand and gravel, silica sand, and zircon, did not play a significant role in the Gambian economy. International Monetary Fund (2006§[1]) reports indicate that the country's gross domestic product (GDP) based on purchasing power parity was $3.02 billion in 2005. Exports, which were valued at $114.4 million in 2004, included cotton, fish, lint, palm kernels, and peanut products (U.S. Central Intelligence Agency, 2005§).

The Department of State for Trade, Industry, and Employment was the Government entity responsible for the administration of the mining sector. A new mineral and mining law proposed in 2001 was still under consideration for approval by the Government in 2005 [Mbendi Information Services (Pty.) Ltd., 2006§]. The Department of State for Finance and Economic Affairs of the Gambia (2006) reported that the Government had put in place policies to attract foreign direct investment, including free repatriation of capital and profits, special investment certificates, and constitutional guarantees and safeguards against nationalization and expropriation of investments.

Carnegie Corporation Ltd. (CCL) of Australia (50%) in joint venture with Astron Ltd. of China (50%) held an exclusive prospecting license for the Batukunku, the Kartung, and the Sanyang mineral sands deposits in Brufut. In 2005, the joint venture completed a second-round trial dredge program at the Sanyang deposit. Following the completion of this dredge program and of an environmental impact assessment study, the company submitted an application to convert its prospecting license to a mining lease. As of yearend, CCL continued to wait for Government approval. Total measured, indicated, and inferred resources at the Batukunku, the Kartung, and the Sanyang deposits were estimated to be 18.8 million metric tons (Mt) that contained about 1 Mt of heavy minerals at a cutoff grade of 1%. The heavy-mineral assemblage for these deposits was estimated to be about 71% ilmenite, 15% zircon, 3% rutile, and 11% other (Carnegie Corporation Ltd., 2005, p. 7-9; Industrial Minerals, 2005a, b).

In terms of the country's infrastructure, a rural electrification project was scheduled to be commissioned in 2006 that would provide electricity to 46 rural towns and villages. According to the Department of State for Finance and Economic Affairs of the Gambia (2006, p. 5), the demand for electricity in The Gambia far outweighs supply, and electricity supply is one of the Government's greatest challenges.

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GUINEA-BISSAU

Guinea-Bissau is a West African country that is bounded to the west by the Atlantic Ocean, to the north by Senegal, and to the east and south by Guinea. In 2005, the population was estimated to be about 1.4 million. The country's total land and water area, which included 60 islands, is 36,120 km^2 (U.S. Central Intelligence Agency, 2006§). Mining in Guinea-Bissau was limited to small-scale production of construction materials, such as clays, granite, limestone, and sand and gravel. The country's prospective minerals include bauxite, diamond, gold, heavy minerals, petroleum, and phosphate rock. In 2005, the GDP based on purchasing power parity was estimated to be about $1.2 billion (International Monetary Fund, 2006§). According to U.S. Central Intelligence Agency statistics, in 1999 (the latest year for which statistics were available) agriculture, which was the mainstay of the economy, accounted for about 62% of the GDP followed by services (26%) and industry (12%). Exports, which were valued at $54 million in 2002, consisted of cashew nuts, lumber, peanuts, palm kernels, and shrimp (U.S. Central Intelligence Agency, 2006§).

Red Back Mining Inc. through its subsidiary Champion Industrial Minerals (CIM) held a mining lease for the Farim phosphate deposit, which was located about 100 kilometers (km) northeast of Bissau. After completing a technical and market evaluation of the Farim phosphate deposit, the company concluded in 2003 that the project had advanced to a stage where it required a level of developmental, operational, and marketing expertise that was beyond CIM's capacity; since that time, the company has attempted to either locate a suitable partner to develop the Farim deposit or to sell it. The company was unsuccessful in both endeavors and, in 2005, continued to keep the Farim project on care and maintenance status. The Farim phosphate rock deposit had estimated resources of more than 166 Mt at a grade of 29% P_2O_5 (Red Back Mining Inc., 2006, p. 3; 2006§).

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[1] References that include a section mark (§) are found in the Internet References Cited sections.

Premier Oil plc of the United Kingdom held exploration licenses for five blocks offshore Guinea-Bissau, namely Block 2, Block 4a, Block 5a, Block 7b, and Block 7c. The company's interest in these blocks was 38.5%, 42%, 42%, 23.75%, and 23.75% respectively. In 2005, Premier acquired three-dimensional (3-D) seismic survey data for a 400-km^2 area and reprocessed existing 3-D seismic data for the Eirozes and the Espinafre salt-diapir prospects, which cover an 800-km^2 area. Premier planned to operate wells back-to-back on these two prospects in 2006 (Premier Oil plc, 2006, p. 10).

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SENEGAL

Senegal is a West African country that is bounded to the west by the Atlantic Ocean, to the northeast by Mauritania and Mali, and to the south by Guinea. The country's estimated 11.1 million inhabitants share a total land area of about 192,000 km^2. Phosphate rock production, which was the country's second most significant foreign exchange earner, dominated Senegal's mining sector (U.S. Department of State, 2006§). Other mineral commodities produced were basalt, cement, clays, gold, laterite, limestone, natural gas, and sand. In 2005, the GDP based on purchasing power parity was estimated to be $20.5 billion. Export estimates were valued at about $1.4 billion and consisted mainly of cotton, fish, peanuts, refined petroleum products, and phosphate rock (International Monetary Fund, 2006§; U.S. Central Intelligence Agency, 2006§).

Commodity Review

Metals

Gold.—At least five companies were exploring for gold in Senegal in 2005, among which were Axmin Inc. (Axmin), IAMGOLD Corp. (IAMGOLD), and Oromin Explorations Ltd. (Oromin) of Canada; Mineral Deposits Limited (MDL) of Australia; and Randgold Resources Ltd. (Randgold) of the United Kingdom. Axmin held exploration permits for the Heremakono, the Sabodala NW, and the Sonkounkou properties, which lie within the Kedougou-Kenieba inlier of the Birimian gold belt that borders Mali. IAMGOLD, which had been exploring in Senegal since the early 1990s, reported that it had spent about $1.9 million in 2005 to complete a diamond drilling program at its Bambadji gold project in the eastern part of the country. Upon completion of the drilling program, the company reported that mineralization was not considered to be continuous at its target zones and announced that it would focus on conducting detailed geologic and geophysical surveys at Bambadji in 2006 with a budget of $1 million (IAMGOLD Corp., 2006, p. 22, 45).

Oromin Joint Venture Group (OJVG), which was a 50-50 joint venture of Oromin and Bendon International Ltd. of Saudi Arabia, was granted an exploration license for 230 km^2 within the Sabodala gold belt in eastern Senegal in February 2004. The company was to conduct an $8 million exploration program at Sabodala during a period of 22 months. OJVG's initial exploration program included ground and airborne geophysics, geochemistry surveys, and about 4,000 meters of drilling at the Golouma and the Kobokoto prospects and at the Sabodala South deposit. The company planned to conduct additional drilling of up to at least 10,000 meters in 2006 (Oromin Explorations Ltd., 2005a-d; 2005a§, b§).

MDL held an exploration permit for a 20.3-km^2 concession within the Sabodala gold belt in southeastern Senegal, which was located about 650 km from Dakar and was adjacent to Oromin's Sabodala gold concession. A joint venture of MDL (70%) and Senegalese private interests (30%) was granted the exploration permit in October 2004. In March 2005, a mining convention for the development of the concession was signed by the Government, and MDL exercised its option to acquire the remaining 30% minority interest after purchasing 9 million common shares and committing to pay $5 million by March 1, 2006. Under the terms of the mining convention, MDL will manage the holding company, Sabodala Mining Company SARL, after March 1, 2006. The Government will hold the remaining 10% interest in the venture (Mineral Deposits Limited, 2005a, d; 2006, p. 18-22).

In June 2005, MDL hired RSG Global to conduct a 20,000-meter-reverse circulation drilling program at Sabodala and appointed Ausenco Limited as the principal engineering contractor for the project. MDL planned to complete an additional 40,000- to 50,000-meter drilling program at Sabodala by April 2006. On October 25, 2005, MDL announced that it had acquired an exploration permit for the Bransan, the Dembala Berola, and the Massa Kounda properties in Senegal.

The Bransan property is located about 5 km from the company's Sabodala project and was being explored by a joint venture of MDL (70%) and Senegalese private interests (30%). The joint venture committed $1 million for exploration during a period of 3 years. The Dembala Berola and the Massa Kounda properties are located farther north of the Sabodala project and were being explored by a joint venture of MDL (80%) and Senegalese private interests (20%) (Mineral Deposits Limited, 2005b-d).

Randgold held four exclusive exploration permits in Senegal for an area that covers 1,326 km^2 within the Sabodala gold belt. The company held a 90% interest each in the Kanoumering, the Kounemba, and the Tomboronkoto permits, and a 63% interest in the Makana permit. In 2005, 3 of the 31 gold targets identified by Randgold were subjected to reconnaissance drilling, 5 were subjected to advanced drilling, and 7 were dropped (Randgold Resources Ltd., 2006, p. 9, 27).

Heavy Minerals.—Among the companies engaged in the exploration of Senegal's mineral sands deposits was the joint venture of MDL and CCL of Australia and Astron of China. MDL held a mining lease for the development of the Grand Côte Zircon Project (GCZP), which is a mineral sands deposit located on the northern coast of Senegal. The deposit, which had been explored by DuPont Chemicals in the 1990s, was located about 100 km north of Dakar and extended northward for more than 50 km. DuPont Chemicals' previous work had confirmed resources of about 19 Mt of ilmenite, 1.7 Mt of zircon, and 950,000 t of HiTi (a mix of rutile and leucoxene). In April 2004, MDL invested $2.55 million in exploration and prefeasibility studies at GCZP and began the engineering and environmental work for a bankable feasibility study (Mineral Deposits Limited, 2005e, p. 4-9). In 2005, the company focused on putting in place the necessary infrastructure, equipment, and personnel needed to complete the feasibility study. As of yearend 2005, inferred resources at GCZP were reported to be 801 Mt of ore at a grade of 2.6% heavy minerals. MDL envisioned an operation that would produce about 75,000 t/yr of zircon and 14,000 t/yr of rutile/leucoxene; first production was expected to begin in 2007 (Mineral Deposits Limited, 2006, p. 8, 16).

In December 2004, CCL and Astron were granted an exclusive exploration license to explore for mineral sands in 750 km^2 of coastal area in southern Senegal. The license covered an area that extends southward from the Gambian border to about 4 km from the company's existing mineral sands project at Brufut. A preliminary reconnaissance study conducted in 2005 yielded heavy mineral grades of from 17% to 52% and a heavy mineral assemblage similar to the Gambian deposits. CCL planned to conduct a wide-spaced drilling program for the area in 2006 followed by drilling below the water table (Carnegie Corporation Ltd., 2004; 2006, p. 10; Industrial Minerals, 2005a, b).

Iron and Steel.—Société des Mines de Fer du Senegal Oriental (MIFERSO) was the Government-owned company in charge of the development of the Faleme iron ore deposit, which is located in southeastern Senegal. In 2004, Kumba Resources Limited of South Africa (KRL), through its subsidiary Kumba International BV, signed an agreement with MIFERSO to conduct a prefeasibility study at Faleme. At the time, KRL reported that the development of the Faleme deposit would require not only the development of the mine and associated infrastructure, but the construction of 311 km of railway line to complete the 741 km of railway line needed to transport the iron ore from the mine to a deepwater port in Dakar, which would also need to be constructed. The preliminary cost of these undertakings was estimated to be about $950 million. Resources at Faleme were estimated to be 260 Mt of ore that contain 58% iron (Kumba Resources Limited, 2004). Upon completion of the prefeasibility study in November 2005, the company exercised its option to acquire an 80% interest in the Faleme project and began a bankable feasibility study for the integrated development of the mine and infrastructure. As of yearend 2005, MIFERSO had put the company's rights to the project under dispute and KRL reported that it would pursue the necessary legal actions to preserve its contractual rights. The envisioned operation at Faleme was expected to produce up to 12 million metric tons per year (Mt/yr) of iron ore, and first production was scheduled for the end of 2008 (Kumba Resources Limited, 2006, p. 44).

Industrial Minerals

Phosphate Rock.—Calcium phosphate rock production totaled about 1.5 Mt in 2005 compared with a revised 1.6 Mt in 2004; phosphoric acid production dropped to 504,000 metric tons (t) in 2005 from 569,000 t in 2004 (table 1). Phosphate ore was mined from the Keur Mor Fall and the Tobene deposits within the Taiba Mine. Part of the marketable phosphate rock was sent to Industries Chimiques du Sénégal (ICS)'s phosphoric acid plants in Darou Khoudoss, and the remainder was sent to the Dakar port for export. ICS was Senegal's phosphate rock mining and processing company. The Government of India, through Indian Farmers Fertilizer Cooperative Ltd. (IFFCO), and Southern Petrochemicals Industries Corporation Ltd. (SPIC) were equity partners in ICS. IFFCO and SPIC collectively held about 30% interest in the company. The facilities at Darou consisted of two adjacent phosphoric acid production plants that had a combined production capacity of 660,000 metric tons per year (t/yr) of P_2O_5. Most of the phosphoric acid produced was exported to India. The company also imported solid sulfur to produce sulfuric acid at the plant. In addition, ICS owned a fertilizer manufacturing unit at Mbao, which is located about 18 km from Dakar. The plant had a production capacity of 250,000 t/yr. In 2005, fertilizer production decreased to 146,000 t from 210,000 t in 2004 (table 1). Fertilizers were produced by combining phosphoric acid with ammonia and potash. Most of the fertilizer produced was sold to West African agriculture markets for the cultivation of cotton, peanuts, and vegetables (Industries Chimiques du Sénégal, 2006§).

Infrastructure

Senegal's national electricity company, Compagnie Sénégalaise d'Electricité (SENELEC), was responsible for generating, transmitting, and distributing the majority of Senegal's electricity. In May 2005, the Board of Executive Directors of the World Bank Group approved a financing package in support of Senegal's electricity sector, which consisted of a loan from the International Finance Corporation of about $21.7 million[2] and an International Development Association risk guarantee of $7.2 million. The loan and risk guarantee were for the Kounoune I Independent Power Project (KIPP), which was a 67.5-megawatt electricity generation plant to be developed in Kounoune east of Dakar. The plant, which was being developed by Matelec S.A.L. (a division of the Doumet Group of Lebanon) and MHI Equipment Europe B.V. (a subsidiary of Mitsubishi Heavy Industries Ltd. of Japan), was to sell electricity to SENELEC under a 15-year purchase agreement (International Finance Corporation, 2005a§, b§).

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[2] Where necessary, values have been converted from European Union euros (€) to U.S. dollars (US$) at the average rate of €1.27470=US$1.00 for 2006.

TABLE 1

THE GAMBIA AND SENEGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Country and commodity		2001	2002	2003	2004[e]	2005[e]
THE GAMBIA[2]						
Clay[3]	metric tons	2,000 [e]	11,814 [4]	12,375 [4]	13,655 [r, 4, 5]	13,700
Laterite[3]		NA	410	227 [4]	245 [r, 4, 5]	250
Silica sand[3]		170 [e]	1,508 [4]	1,534 [4]	1,389 [r, 4, 5]	1,390
Zircon		--	--	13 [4, 6]	-- [r, 4, 5]	--
SENEGAL[7]						
Basalt[3]		NA	116	363 [8]	360	360
Cement, hydraulic		1,539	1,653	1,694	1,700	1,700
Clay[3]		NA	19	21 [8]	20	20
Clays, Fuller's earth (attapulgite)		121	138	195	200	200
Gold[e, 9]	kilograms	550	600 [5]	600 [5, 8]	600	600
Laterites[3]		NA	112	304 [8]	300	300
Limestone[3]		NA	1,461	1,588 [8]	1,600	1,600
Natural gas[e]	thousand cubic meters	56,000	3,368 [5]	12,638 [5, 8]	12,600	12,600
Petroleum:[e]						
Crude oil	thousand 42-gallon barrels	1	--	--	--	--
Refinery products	do.	6,424 [5]	6,400	6,400	6,400	6,400
Phosphate rock and related products:[10]						
Calcium phosphate-based fertilizers[11]		203	201	251	210 [5]	146 [5]
Crude rock:						
Aluminum phosphate		34	4	4 [8]	4	4
Calcium phosphate[11]		1,708	1,547	1,761 [5, 8, 12]	1,576 [r, 5]	1,451 [5]
Phosphoric acid, P_2O_5 content[11]		359	581	511	569	504
Salt		110	172	235	240	240
Sand[3]		NA	860	2,168 [8]	2,170	2,170

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through September 18, 2006.

[2] In addition to the commodities listed, The Gambia also produced a variety of construction materials (laterite, sand, and shell), but information is inadequate to make reliable estimates of output.

[3] Values converted from cubic meters to metric tons. Specific gravity, in grams per cubic meter--basalt, 2.8; clay, 2.55; laterites, 2.55; limestone, 2.6; and sand, 2.6.

[4] Source: Geology Department of the Republic of The Gambia.

[5] Reported figure.

[6] From sales.

[7] In addition to the commodities listed, Senegal also produced sand and gravel, and stone for local construction purposes, but information is inadequate to make reliable estimates of output.

[8] Source: Direction des Mines et de la Geologie, République du Sénégal.

[9] Government estimate of unreported production of artisanal gold.

[10] Industries Chimiques du Sénégal was the main producer of phosphate rock in Senegal. Phosphate rock production excludes about 200,000 metric tons per year, which is estimated to be produced from other Senegalese sources.

[11] Source: Industries Chimiques du Sénégal.

[12] Reported number may include production from other sources besides that of Industries Chimiques du Sénégal, which was reported to be 1,472 thousand metric tons in 2003.

TABLE 2
SENEGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of mine facilities	Annual capacity
Attapulgite	Senegal Mines (Government, 49%, and private, 51%)	240 kilometers south of Dakar	100.
Do.	Société Senegalaise de Phosphates de Thies SA (private, 100%)	Lam Lam	NA.
Cement	Les Ciments du Sahel S.A. of Senegal (private, 100%)	Kirene plant	600.
Do.	Société Ouest Africaine des Ciments (private, 100%)	Rufisque plant	1,600.
Petroleum products	Total S.A. (54%), Royal Dutch Shell plc (23%), ExxonMobil (13%), Government (10%)	Dakar refinery	1,226.
Phosphate rock, calcium	Industries Chimiques du Sénégal Group (Government, 70%, and Indian Farmers Fertilizer Cooperative Ltd. and Southern Petrochemicals Industries Corporation Ltd., collectively, 30%)	Taiba Mine	2,000.
Do.	Société Senegalaise de Phosphates de Thies SA (private, 100%)	Lam Lam, Sebikhotane, and Allou-Kagne	NA.
Phosphoric acid	Industries Chimiques du Sénégal Group (Government, 70%, and Indian Farmers Fertilizer Cooperative Ltd. and Southern Petrochemicals Industries Corporation Ltd., collectively, 30%)	Darou I plant, Darou Khoudoss	330 P_2O_5.

NA Not available.

THE MINERAL INDUSTRY OF GHANA

By Omayra Bermúdez-Lugo

The Republic of Ghana is located in western Africa and is bordered to the south by the Gulf of Guinea, to the north by Burkina Faso, to the west by Côte d'Ivoire, and to the east by Togo. The country's 21.1 million inhabitants shared an area of about 238,500 square kilometers (km^2) (World Bank Group, The, 2005§[1]). In 2005, real gross domestic product (GDP) growth was estimated to be 5.9% and was projected to increase to 6.1% in 2007 (Organisation for Economic Co-operation and Development, 2006, p. 283); the nominal GDP based on purchasing power parity was estimated to be about $55.2 billion in 2005 compared with $50.4 billion in 2004 (International Monetary Fund, 2006§). Ghana's economy was primarily based on agriculture, which accounted for about 50% of the GDP and 60% of total employment (Organisation for Economic Co-operation and Development, 2006, p. 284). Mineral commodities produced in the country were aluminum, bauxite, diamond, gold, manganese, natural gas, petroleum, salt, and silver.

Ghana's mineral industry had been stagnant for more than 30 years prior to the establishment of the 1984 Economic Recovery Program and the promulgation of the 1986 Minerals and Mining Law. According to the Ghana Chamber of Mines (2006, p. 6-12), the contribution of the mining sector to the country's GDP increased from 1.3% in 1991 to an average of about 5% in recent years, export earnings from minerals have averaged 35%, and the sector is one of the leading contributors to Government revenues through the payment of mineral royalties, employee income taxes, and corporate taxes. The Organisation for Economic Co-operation and Development (OECD) (2006, p. 284) reported, however, that although Ghana's industrial sector (which includes mining) had continued to show signs of recovery, industrial production was not growing rapidly enough to attain the Government's objective of having the industrial sector account for about 37% of the GDP by 2010. OECD estimated that the mining and quarrying subsectors had grown at a slower pace than that of the economy as a whole and that the growth rate of these subsectors had slowed to 3% in 2005 from 4.5% in 2004, and 4.7% in 2003. On the other hand, the World Bank, through the International Finance Corporation (2006§), estimated that in 2005 Ghana's mining sector accounted for about 5% of the country's GDP, 30% of exports, and 3% to 4% of Government fiscal revenues, and that gold production accounted for about 95% of total mining export proceeds.

Government Policies and Legislation

The Ministry of Mines and Energy oversaw all aspects of Ghana's minerals sector and was the entity responsible for granting mining and exploration licenses. Ghana National Petroleum Corp. (GNPC) was the Government entity responsible for petroleum exploration and production. On December 15, 2005, the Ghanian Parliament passed into law a new minerals and mining bill. Some of the provisions under the new Minerals and Mining Law, law No. 703, included access to mineral rights on a first-come, first-considered basis; a specific timeframe within which all applications are expected to be granted; the right for applicants to demand written reasons from the Minister if an application is rejected; the Government's right to acquire land or authorize its occupation and use if the land is required for mining purposes; the establishment of a cadastral system for the administration of mineral rights; a provision establishing the range of royalty rates, which is not to be less than 3% or exceed 6% of total mining revenues; the Government's right to obtain a 10% free-carried interest in mining leases; and the establishment of the period of duration of a mining lease, which is not to exceed 30 years and which may be renewed once for a period not to exceed an additional 30 years (Mining Journal, 2006; Ghanian Chronicle, The, 2005§).

The Precious Minerals Marketing Corporation (PMMC) was the entity responsible for promoting the development of small-scale gold and diamond mining in Ghana. It was also responsible for purchasing the output of such mining, either directly or through licensed buyers.

Structure of the Mineral Industry

In the gold sector, Gold Fields Limited of South Africa held a 71.1% interest in the Tarkwa and the Damang gold mines in a joint venture with Toronto-based IAMGOLD Corp. (18.9%), and the Government of Ghana (10%) (U.S. Securities and Exchange Commission, 2005, p. 41). AngloGold Ashanti Ltd. of South Africa operated the Bibiani and the Iduapriem open pit gold mines and the Obuasi underground gold mine. The Bibiani and the Obuasi Mines were 100% owned by AngloGold Ashanti and the Iduapriem Mine was 80% owned by AngloGold Ashanti and 20% by the International Finance Corporation (AngloGold Ashanti Ltd., 2006a-c). Golden Star Resources Ltd. held a 90% interest in the Bogoso/Prestea and the Wassa open pit mines and a 90% interest in the idled Prestea underground mine. Newmont Mining Corp. of the United States held a 100% interest in the Ahafo gold property and an 85% interest in the Akyem gold property. Companies exploring for gold in Ghana included Adamus Resources Ltd., African Gold plc, Moydow Mines International Inc., and Pelangio Mines Inc.

In the bauxite and alumina sector, Alcoa Inc. of the United States held a 10% interest in Volta Aluminum Company Ltd. (Valco); the remaining equity was owned by the Government. Alcan Aluminum Ltd. of Canada held an 80% interest in Ghana Bauxite Company Ltd.; the Government held the remaining 20% interest. Additional information on the structure of the mineral industry can be found in table 2.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Environmental Issues

The Ghanian Environmental Protection Agency (EPA) was the Government entity responsible for the formulation of policies on all aspects of the environment. The agency's functions included acting in liaison and cooperating with other Government agencies; collaborating with foreign and international agencies, as necessary; conducting investigations into environmental issues; coordinating the activities of bodies concerned with the technical aspects of the environment for the purpose of controlling the generation, treatment, storage, transportation, and disposal of industrial waste; ensuring compliance with environmental impact assessment procedures; issuing environmental permits and pollution abatement notices; making recommendations to the Government for the protection of the environment; prescribing standards and guidelines related to the pollution of air, water, and land; protecting and improving the quality of the environment; and securing the control and prevention of discharge waste into the environment among several other functions (Environmental Protection Agency, 2006, p. 3-4).

In 2005, the Center for Public Interest Law and the Center for Environmental Law, two Accra-based nongovernmental organizations, sued Bonte Gold Mines Ltd. (an 85% owned subsidiary of Akrokeri-Ashanti Gold Mines Inc. of Canada), Ghana's Minerals Commission, and the EPA for the reclamation of the environment after the cessation of Bonte's gold mining operations along the Jeni River. Bonte closed its operations at Bonteso in the Ashanti region in March 2004, citing problems concerning low-grade ore, equipment unavailability, and a default of its financial obligations during 2003. The company allegedly did not follow the due process for mine decommissioning, such as by failing to post bonds to the EPA for the reclamation of lands, failing to notify workers of its intention to liquidate, not paying up-to-date wages to workers, and leaving a debt of about $18 million owed to various state institutions and private companies. The EPA and the Minerals Commission were accused of failing to ensure Bonte's compliance to operate in a sustainable manner (Center for Public Interest Law, 2005§; Ghanaweb.com, 2005b§; Mining News, The, 2005§).

Trade

According to the U.S. Census Bureau, Ghana's exports to the United States were valued at about $158.4 million in 2005 compared with about $145.4 million in 2004 and $81.9 million in 2003; $57.7 million of these exports was from petroleum products; $2.5 million, gem-quality diamond; and $1.5 million, gold (U.S. Census Bureau, 2006b§). Imports from the United States were valued at about $340 million in 2005 compared with about $310 million in 2004 and $209 million in 2003. These included nearly $31 million for excavating machinery; $4.7 million for drilling and oilfield equipment; $3 million in specialized mining equipment; and $780,000 for petroleum products (U.S. Census Bureau, 2006a§).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—In January 2005, Alcoa signed a memorandum of understanding (MOU) with the Government to develop an integrated aluminum industry in Ghana that would include bauxite mining, alumina refining, aluminum production, and rail transportation infrastructure upgrades. The MOU called for the restart of three of the five existing potlines at the idled Valco smelter, which would produce about 120,000 metric tons per year (t/yr) of aluminum; the designed capacity of the plant is 200,000 t/yr. The Government and Alcoa planned to restart the Valco smelter as soon as an interim power rate agreement is reached with the Volta River Authority. The Government (90%) was to be the managing owner of the smelter and Alcoa (10%), through its subsidiary, Alcoa World Alumina and Chemicals [a joint venture between Alcoa Inc. (60%) and Alumina Limited of Australia (40%)] was to supply alumina and serve as the distributor of export sales of aluminum. The Government had acquired Kaiser Aluminum Corp.'s 90% interest in Valco in 2004. Kaiser closed the Valco plant in 2003 after struggling with fluctuating operating levels for several years and dealing with restricted power allocations from the Volta River Authority (Alcoa Inc., 2005a, b).

Gold.—In October 2005, Red Back Mining Inc. of Canada [through its subsidiary Chirano Gold Mines Limited (CGML)] commissioned a new mine in Ghana. The mine, known as the Chirano gold mine, was an open pit operation located about 21 kilometers (km) to the south of AngloGold Ashanti's Bibiani gold mine in western Ghana. The Chirano gold mine produced 941 kilograms (kg) (reported as 30,247 troy ounces) in 2005 and was 100% owned by Red Back; the Government had the option to exercise its right to back into a 10% ownership in CGML. Chirano was scheduled to produce an average of about 3,800 kg (reported as 123,000 troy ounces) per year during a period of 8½ years. The designed capacity of the processing plant was 2.1 million metric tons per year (Mt/yr). A revised resource and reserve estimate for the Chirano Mine was underway in 2005. The economic potential of the Akwaaba deposit, a high-grade deposit within the Chirano mining concession, was being evaluated in 2005, and a resource estimate of the deposit was scheduled for completion in October 2006 (Red Back Mining Inc., 2006, p. 4-6; 2006§).

In 2005, gold production at the Bibiani Mine came from the processing of ore from the mine's remaining pits, stockpiled ore, and tailings. Satellite pits were depleted in December 2005, and AngloGold Ashanti expected stockpiled ore to be depleted by January 2006. Beginning in February, the mill was to process only old tailings. The Bibiani Mine, which had operated between 1903 and 1968 as an underground mine, was reopened in 1998 as an open pit mine with a carbon-in-leach (CIL) plant. The mine included old tailings dumps, which were reclaimed in December 2004. These tailings were expected to yield about 3.9 million metric tons (Mt) of ore at an estimated recovery grade of 0.60 gram per metric ton (g/t) gold during a period of 18 months. The company was studying the viability of restarting production from its main pit to a depth of about 60 meters below the current pit floor. Underground exploration was suspended in July 2005 and the underground mine continued to be on care-and-maintenance status. Gold production was expected to decrease to 1,700 kg in 2006 from 3,580 kg (reported as 115,000 troy ounces) in 2005 (AngloGold Ashanti Ltd., 2006a).

Gold production at the Iduapriem open pit mine increased to 6,380 kg in 2005 (reported as 205,000 troy ounces) from 4,570 kg in 2004 owing to an increase in throughput at the processing plant. AngloGold Ashanti held an 80% interest in the Iduapriem Mine; the remaining 20% was held by the International Finance Corporation. The company also held a 90% interest in the Teberebie Mine, which is adjacent to the Iduapriem Mine; the Government held the remaining 10% interest (AngloGold Ashanti Ltd., 2006b).

In 2005, gold production at the Obuasi underground mine was hindered by a breakdown at the main processing plant during the first quarter of 2005 and the failure of a primary crusher during the third quarter; production, however, increased to 12,200 kg (reported as 391,000 troy ounces) from 7,930 kg in 2004 mostly owing to the start of mining from the Kubi surface oxide deposit. In terms of growth prospects, the company planned to develop the deep-level ore deposits at Obuasi known as the Obuasi Deeps, which were expected to extend the project's mine life to 2040. The development of Obuasi Deeps will require an initial investment of $44 million during the next 4 years to conduct further exploration and feasibility studies. The total capital expenditure for the development of the Obuasi Deeps was estimated to be about $570 million. AngloGold Ashanti held a 100% interest in the Obuasi Mine (AngloGold Ashanti Ltd., 2006c).

The Wassa open pit gold mine produced 2,149 kg of gold in 2005. The mine, which is located about 150 km west of Accra, was owned by Golden Star (90%) and the Government (10%). The mine had been in operation as an open pit heap-leach mine in the 1990s but was closed in 2001. Golden Star acquired the mine in 2002 after determining that conventional CIL processing was economically feasible. Plant feed in 2005 was a mixture of newly mined ore from the Wassa pit blended with material from the heap-leach pads left by the previous operation. Golden Star's planned to increase production at Wassa to about 3,700 kg (reported as 120,000 troy ounces) in 2006 and to produce about 4,000 kg (reported as 130,000 troy ounces) in 2007 as higher grade ores are reached at deeper levels. As of December 31, 2005, total probable mineral reserves at Wassa were reported to be 21.9 Mt at a grade of 1.34 g/t gold (Golden Star Resources Ltd., 2006, p. 32).

In addition to the Wassa Mine, Golden Star operated the Bogoso/Prestea open pit mine, which is located about 300 km west of Accra. Bogoso/Prestea produced 4,103 kg of gold in 2005. Golden Star held a 90% interest in the property, and the Government of Ghana held the remaining 10%. About 75% of the remaining ore reserve at Bogoso/Prestea is sulfide. Because this type of ore cannot be processed using the company's existing CIL plant, the company decided in June 2005 to build a new 3.5-Mt/yr processing plant which will use biooxidation to treat the remaining sulfide ore. The new processing plant was scheduled to be completed in late 2006 (Golden Star Resources Ltd., 2006, p. 31).

The Prestea Underground gold mine, which is also 90% owned by Golden Star, remained idle during the year. Prestea Underground was closed in early 2002 owing to low gold prices. During 2005, a total of 8,096 meters of underground exploration drilling was completed at the mine; drilling was to continue in 2006. Golden Star planned to complete a prefeasibility study by the end of 2006 to evaluate the economic potential of restarting production at Prestea Underground. As of December 31, 2005, inferred mineral resources at the mine were estimated to be 6.1 Mt at an average grade of 8.1 g/t (Golden Star Resources Ltd., 2006, p. 33).

In 2005, Newmont announced the company was advancing the Ahafo and the Akyem gold properties to production. The Ahafo property, which is located about 300 km northwest of Accra between the towns of Kenyase and Ntotoroso, was expected to begin production during the second half of 2006. Production of gold was expected to be about 17,100 kilograms per year (kg/yr) (reported as 550,000 troy ounces), with a mine life estimated to be more than 20 years. The company was awaiting the issuance of a mining license for the development of the Akyem property, which is located in Ghana's eastern region, about 130 km northwest of Accra between the towns of New Abirem and Ntronang. Newmont expected to begin production at Akyem in 2008 and to produce about 15,500 kg/yr of gold (reported as 500,000 troy ounces) (Newmont Mining Corp., 2006, p. 17).

About 19.6 Mt of ore was processed at Tarkwa in 2005 from which 21,051 kg of gold was produced (Gold Fields Limited, 2006§). In November 2005, a new semiautogenous grinding (SAG) mill and CIL plant were commissioned at the Tarkwa Mine. The Tarkwa Mine, which is located in southwestern Ghana about 300 km west of Accra, consists of several open pit operations, one CIL plant, and two heap-leach facilities. Some underground mining had been conducted in the past, but underground operations ended in 1999. As of June 30, 2005, proven and probable reserves at Tarkwa were estimated to be about 417,000 kg of gold (reported as 13.4 million troy ounces) and to last until 2025 at current production rates (U.S. Securities and Exchange Commission, 2005, p. 41-43).

The Damang Mine, which is located in the Wassa West District in southwestern Ghana about 360 km west of Accra and 30 km northeast of Tarkwa Mine, consists of an open pit operation, a SAG mill, and a CIL plant. The mine processed about 5.2 Mt of ore in 2005 and produced about 7,700 kg of gold. Owing to the depletion of the high-grade ore in the main Damang pit, an exploration program to seek for alternative ore sources was launched during the year. The exploration program resulted in the establishment of the Amoanda, the Rex, and the Tomento pits, and the extension of an old pit at Kwesie-Lima. Gold Fields and its partners reported that production from the new pits was to be processed along with stockpiles of lower grade ore. Mining of the Tomento pit began in July 2005 and mining of the Amoanda pit began during the fourth quarter of 2005; production from the Rex pit was scheduled to begin in 2007. As of June 30, 2005, proven and probable reserves at Damang were estimated to be about 40,000 kg of gold (reported as 1.3 million troy ounces) and were projected to last until 2010 at current production rates (U.S. Securities and Exchange Commission, 2005, p. 44-45; Gold Fields Limited, 2006§).

Industrial Minerals

Cement.—The Building and Road Institute of the Council for Scientific and Industrial Research of Ghana was conducting laboratory tests to evaluate the possibility of producing pozzolana cement from bauxite mining waste (known as red mud or clay). The two companies that produced cement in Ghana, Ghana Cement Works Ltd. and Diamond Cement Ghana Limited, used imported clinker, gypsum, and limestone for the manufacturing of cement. About 2 Mt of clinker was imported in 2003 for the production of portland cement (Ghanaweb.com, 2005a§).

Diamond.—Ghana produced about 1 million carats of diamond in 2005 (table 1). Diamond production was recovered by artisanal miners from alluvial and in situ diamond deposits near Akwatia in the Birim Valley. The only formal commercial production came from a diamond placer mine in Akwatia, which was operated by Government-owned Ghana Consolidated Diamonds Ltd. (GCD).

According to a 2004 report by Partnership Africa Canada and Global Witness Publishing Inc. (2004, p. 3-4), prior to the creation of the PMMC in 1989, as much as 70% of Ghana's diamond was smuggled out of the country. Following the creation of PMMC, diamond was initially shipped to a PMMC office in Antwerp, Belgium, for sale; currently, an open market has been established in Ghana in which registered buyers can operate from offices within the country and in which licensed diamond traders are allowed to operate. All buyers (exclusively Ghanian nationals) must transfer U.S. dollars through the Central Bank in advance for the purchase of diamond. Only about 200 of the 1,000 registered buyers were thought to be active during 2004. Purchased diamond was kept under lock in the custody of the PMMC and subject to inspection before being exported. According to the report, Ghana was fully implementing the Kimberley Process but the country lacked the resources to monitor and control illicit diamond mining and buying, especially from the artisanal mining areas. In Akwatia, for example, an informal diamond market existed where no paperwork was required to buy or sell diamond; this market was known locally as the "Belgian market." The report also indicated the possibility of diamond being smuggled from Côte d'Ivoire, especially following the sanctions on diamond exports imposed on this country in 2004 (Partnership Africa Canada and Global Witness Publishing Inc., 2004, p. 3-5).

It was reported that while annual diamond production from GCD continued to decline, diamond production from artisanal miners was increasing and that there was a possibility for the privatization of GCD. Foreign companies (not identified) were said to be interested in the Akwatia alluvial diamond field in the upper Birim River catchment area (Mining Journal, 2005).

Mineral Fuels

Dallas-based Kosmos Energy LLC held an 86.5% working interest in the West Cape Three Points (WCTP) Block in the Gulf of Guinea's Tano Basin. In 2005, the company conducted a 1,075-km^2 three-dimensional (3-D) survey to evaluate the potential of the block. The WCTP Block is located about 8 km from the Ghanian coastline and 95 km southwest of the city of Takoradi. The remaining interest in WCTP was held by GNPC (10%) and E.O. Group of Ghana (3.5%) (Kosmos Energy LLC, 2005§).

Final environmental impact assessment permits were granted in Benin, Ghana, and Togo for the West African Gas Pipeline (WAGP) between March and April 2005. The West African Gas Pipeline Company Limited (WAGPCo) was granted a license to construct the pipeline in April, and the first shipload of about 8,000 pipes was delivered to the Tema Port in May. In September, Chevron Corporation, which is the WAGP project manager, announced that WAGPCo had begun the installation of the 569-km main offshore segment of the pipeline. The WAGP was expected to be operational by December 2006 and to deliver gas to powerplants and industries in Benin, Ghana, Nigeria, and Togo (Chevron Corporation, 2005; West African Gas Pipeline Company Limited, 2006§).

Vanco Energy Company explored for petroleum at the Cape Three Points Deepwater Block (CTPD), which is located in the Tano-Ivorian Basin. The company had signed an exploration agreement with the Government in 2002 at which time it conducted a two-dimensional (2-D) seismic program to evaluate the block. In 2005, the company carried out a 1,500-km^2 3-D seismic program to further define the structural and stratigraphic prospects in the block. The first well in the CTPD Block was planned for 2007 (Vanco Energy Company, 2006§).

Infrastructure

Improving transport infrastructure remained a focal point of Ghana's development agenda, especially with the advent of the civil conflict in Côte d'Ivoire, which has increased the importance of Ghana's roads as a transit corridor for neighboring land-locked countries (Organisation for Economic Co-operation and Development, 2006, p. 290). Road transport accounted for about 98% of freight moved in the country. The country's basic road infrastructure consisted of 50,000 km of roads, 40% of which the Government estimated to be in good condition, 30% in fair condition, and 30% in poor condition. The country's infrastructure also included the Ports of Tema and Takoradi and a smaller port on Lake Volta, which handles inland water transport; one international airport at Accra and four other regional airports; and a 1,300-km-long railway system in the southern part of the country, which connects Accra, Kumasi, and Sekondi-Tekoradi. OECD reported that, given the railway's poor condition, the Government had launched a program to privatize the entire railway system with the assistance of the World Bank and that, since 2000, the Government had collaborated with multinational mining companies to maintain vulnerable sections of the railway network. In 2005, a bidding round was opened to operate the railway lines under a concession arrangement (Organisation for Economic Co-operation and Development, 2006, p. 291).

Outlook

The gold sector is likely to continue to lead Ghana's mineral industry. The passing into law of the new mineral bill as well as other developments in 2005, which included plans to develop an integrated aluminum industry, rail transportation infrastructure upgrades, the restarting of the Volta aluminum smelter, and the likelihood of the WAGP coming onstream in 2006, suggest that the Government is interested in continuing to develop the country's mineral industry. In the short run, additional production that will result from the commissioning of the Chirano gold mine in 2005, increased production at the Wassa Mine in 2006 and 2007, and the coming online of gold production from the Ahafo Mine in 2006 and the Akyem Mine in 2008, are likely to counterbalance the loss in production that will result from the eventual depletion of satellite pits at the Bibiani Mine.

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TABLE 1

GHANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
Aluminum:						
Bauxite, gross weight		678	684	495	498 [3]	726 [3]
Metal, smelter, primary		144	117	16	--	13
Cement, hydraulic[e, 4]		1,900	1,900	1,900	1,900	1,900
Diamond:						
Gem[e]	thousand carats	936	770	724	725	850
Industrial[e]	do.	234	193	180	180	213
Total[5]	do.	1,170	963	904	905 [3]	1,063 [3]
Gold[6]	kilograms	68,341	69,271	70,749	63,139 [3]	66,852 [3]
Manganese:						
Ore, processed		1,077	1,136	1,509	1,597 [3]	1,715 [3]
Mn content[e]		344	363	528	559 [3]	600
Natural gas	million cubic meters	--	--	112	112	100
Petroleum:						
Crude	thousand 42-gallon barrels	3,285	2,555	3,000 [e]	3,000	2,190
Refinery products:[e]						
Liquefied petroleum gas	do.	-- [3]	625	625	625	625
Gasoline	do.	2,445 [3]	5,850	5,850	5,850	5,850
Jet fuel	do.	511 [3]	625	625	625	625
Kerosene	do.	767 [3]	1,950	1,950	1,950	1,950
Distillate fuel oil	do.	2,628 [3]	4,450	4,450	4,450	4,450
Residual fuel oil	do.	1,862 [3]	1,250	1,250	1,250	1,250
Other, including refinery fuel and loss	do.	767 [3]	1,250	1,250	1,250	1,250
Total	do.	8,980 [3]	16,000	16,000	16,000	16,000
Salt[e]		68	99	250	265 [3]	300
Silver, content of exported doré	kilograms	1,945	2,129	3,379	3,329 [3]	3,300
Steel, secondary, rebar[e]		75	75	75	75	75

[e] Estimated. -- Zero.

[1] Table includes data available through December 2006.

[2] In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) are produced, as are limestone and lime for the processing of some gold ore and salt. Output of these commodities is not reported, however, and information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] All from imported clinker.

[5] Production, in thousand carats, includes that of Akwatia Mine: 2001--300 (estimated); 2002--268; and 2003--240 (estimated).

The remainder is artisanal sales to the Precious Metals Marketing Corporation. Estimates of unreported artisanal production are not included.

[6] Does not include estimate of smuggled or undocumented production.

TABLE 2
GHANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	thousand metric tons	Volta Aluminum Co. Ltd. (Valco) (Government, 90%, and Alcoa Inc., 10%)	Aluminum smelter at Tema (to restart in 2006)	200.
Bauxite	do.	Ghana Bauxite Co. Ltd. (Alcan Aluminum Ltd., 80%, and Government, 20%)	Bauxite mine at Awaso	1,000.
Cement	do.	Ghana Cement Works Ltd. (Heidelberg Zement AG of Germany, 94.5%)	Clinker grinding plant at Takoradi	1,200.
Do.	do.	do.	Clinker grinding plant at Tema	1,200.
Do.	do.	Diamond Cement Ghana Limited	Cement plant at Aflao; uses imported clinker	600.
Diamond	thousand carats	Ghana Consolidated Diamonds Ltd. (Government, 100%)	Placer mine at Akwatia Birim Valley	360.
Do.	do.	Artisanal diamond miners	Birim Valley	500 to 900.
Gold	kilograms	AngloGold Ashanti Ltd., 100%	Obuasi underground mine, Ashanti region	17,000.
Do.	do.	AngloGold Ashanti Ltd., 80%, and International Finance Corporation, 20%	Iduapriem/Teberebie Mine	8,800.
Do.	do.	AngloGold Ashanti Ltd., 100%	Bibiani Mine	7,000.
Do.	thousand metric tons	Bogoso Gold Ltd. (Golden Star Resources Ltd., 90%, and Government, 10%)	Bogoso processing carbon-in-leach plant	1,500 ore.
Do.	kilograms	do.	Bogoso/Prestea open pit	5,400.
Do.	thousand metric tons	Wexford Goldfields Ltd. (Golden Star Resources, Ltd., 90%, and Government, 10%)	Wassa carbon-in-leach processing plant	3,500 ore.
Do.	do.	Wexford Goldfields Ltd. (Golden Star Resources, Ltd., 90%, and Government, 10%)	Wassa biooxidation processing plant	3,500 ore.
Do.	kilograms	Wexford Goldfields Ltd. (Golden Star Resources, Ltd., 90%, and Government, 10%)	Wassa Mine, 30 kilometers northwest of Tarkwa	5,200.
Do.	do.	Bogoso Gold Ltd. (Golden Star Resources, 90%, and Government, 10%)	Prestea underground mine (not operating)	1,100.
Do.	do.	Bonte Gold Mining Ltd. (Akrokeri-Ashanti Gold Mines Inc., Canada, 85%; Government, 10%; Buosiako Co. Ltd., Ghana, 5%)	Placer mine at Jeni River, 40 kilometers southwest of Kumasi (closed in 2004)	2,000.
Do.	thousand metric tons	Gold Fields Limited, 71.1%; IAMGOLD Corp., 18.9%; Government, 10%	Tarkwa open pit mine and carbon-in-leach and heap-leach plants, 300 kilometers west of Accra	20,000 ore.
Do.	do.	Gold Fields Limited, 71.1%; IAMGOLD Corp., 18.9%; Government, 10%	Damang Mine and carbon-in-leach plant, 360 kilometers west of Accra	4,600 ore.
Do.	kilograms	Newmont Mining Corp., 100%	Ahafo (Yamfo-Sefwi) deposit, near Kenyasi (2006 startup)	17,100.
Do.	do.	do.	Akyem deposit, west of Kibi (2008 startup)	15,500.
Do.	thousand metric tons	Red Back Mining Inc., 100%	Chirano Mine, 100 kilometers from Kumasi, southwest Ghana	2,100 ore
Do.	kilograms	do.	do.	3,800.
Limestone and lime		Carmeuse Lime Products (Ghana) Ltd. (Carmeuse SA of Belgium)	Takoradi	NA.
Manganese ore	thousand metric tons	Ghana Manganese Company Limited (Ghana International Manganese Co., 90%, and Government 10%).	Open pit mine at Nsuta-Wassaw, Western region	1,500.
Petroleum, crude	thousand barrels	Ghana National Petroleum Corp. (Government, 100%)	Saltpond and Tano Fields	3,500.
Petroleum products	do.	Tema Oil Refinery (Government, 100%)	Refinery at Tema	16,425.
Salt	do.	Panbros Salt Industry Ltd.	Salt pan at Mendskrom, near Accra	NA.
Do.	do.	Elmina Salt Producers Association	Artisanal salt pan mining near Elmina	NA.

NA Not available.

THE MINERAL INDUSTRY OF GUINEA

By Omayra Bermúdez-Lugo

In 2005, Guinea's mineral production consisted mainly of alumina, bauxite, cement, diamond, gold, and salt. Undeveloped mineral resources included graphite, iron, limestone, manganese, nickel, and uranium. Guinea continued to rank among the world's top five producers of bauxite (Plunkert, 2006). The country's bauxite-bearing regions were Lowland-Guinea, Mid-Guinea, and Upper-Guinea. Bauxite resources in these regions were estimated to be 5 billion metric tons (Gt), 2 Gt, and 500 million metric tons (Mt), respectively, and ranged between 44% and 53% Al_2O_3 and between 2% and 3% SiO_2 (Ministry of Mines and Geology, 2005a). Alumina Company of Guinea (ACG), Compagnie des Bauxites de Guinée (CBG), and Compagnie des Bauxites de Kindia (CBK) were the country's three bauxite producers. ACG was a joint venture between Russian Aluminum Group (RUSAL) (85%) and the Government (15%), CBG was a joint venture between Halco Mining Inc. (51%) and the Government (49%), and CBK was 100% owned by RUSAL. Halco, in turn, was a joint venture among Alcan Inc. (Alcan) (45%), Alcoa World Alumina LLC (Alcoa) (45%), and Dadco Group (10%) (Alcan Inc., 2005; Find Articles, 2005§[1]).

According to the U.S. Securities and Exchange Commission (2006, p. 8, 10), Alcan purchased about 6.4 Mt of bauxite from CBG in 2005 under contracts in effect through 2011. In November 2005, Alcan and Alcoa signed a basic agreement with the Government of Guinea to set forth the framework for the development of the Kamsar alumina refinery. Alcan and Alcoa had signed a memorandum of understanding with the Government in 2004 to jointly build a new 1.5-Mt/yr alumina refinery in Kamsar. In 2005, a detailed feasibility study was launched at an estimated cost of between $25 million and $30 million. If the final results of the study are favorable, the partners expected to make an investment decision to begin construction in early 2007 and planned to produce the first alumina by 2009 (Alcan Inc., 2006, p. 2, 47).

During the year, RUSAL continued with its plan to increase production capacity at the Friguia alumina refinery to 1.4 million metric tons per year (Mt/yr) from its existing capacity of 780,000 metric tons per year (t/yr). The company expected to launch Friguia's capacity expansion program in 2006 and have it completed by 2009 (Russian Aluminum Group, 2006; 2006§).

In February 2005, Global Alumina Corporation (GAC) (formerly known as Global Alumina Products Corporation; the name was changed in April 2005) signed a memorandum of understanding with Technip France S.A. for Technip to assume the role of engineering, procurement, and construction contractor for the construction of the company's 2.8-Mt/yr alumina refinery in Boke (Global Alumina Corporation, 2006, p. 12). Later during the year, Dubai Aluminium Company (Dubal) signed a $200 million agreement with GAC to acquire a 25% stake in GAC, which was in addition to a previous long-term supply agreement to acquire 40% of the company's planned refinery production. First production was expected to start at the end of 2008 with full production to be reached by 2009 (Australia Arab Chamber of Commerce and Industry Inc., 2005; Mining Journal, 2005b; Global Alumina Corporation, 2006, p. 12).

Gold in Guinea occurred as veins and alluvial deposits and was mined on artisanal, small, and industrial scales. The country's main gold-bearing area was the Siguiri Basin, which is located within the Upper-Guinea region. Gold is also found in the Fitaba, the N'Zerekore, and the Sierra-Fore areas and was produced by Société Ashanti de Guinée (SAG), Société d'Exploitation Minière d'Afrique de l'Ouest-Guinée (SEMAFO-Guinée), Société Minière de Dinguiraye (SMD), and small-scale and artisanal miners.

SAG, which was owned by AngloGold Ashanti Ltd. (85%) and the Government (15%), operated the Siguiri gold mine. In 2005, production at the Siguiri Mine increased to 8,989 kilograms (kg) from a revised 3,048 kg in 2003. The company attributed the increase in production to the transition from heap-leach operations to a newly commissioned carbon-in-pulp plant. The Siguiri Mine is located about 850 kilometers (km) northeast of Conakry in the Prefecture of Siguiri. Gold was mined from primary gold deposits (AngloGold Ashanti Ltd., 2006, p. 66-67).

SMD, which was owned by Guinor Gold Corp. of Canada (85%) and the Government (15%), mined gold deposits at the Lero Mine. The Lero gold mine was located at the border between the Prefectures of Dinguiraye and Siguiri. In October 2005, London-based Crew Gold Corporation announced its intention to acquire Guinor through the purchase of 100% of the company's common shares at a price of $1.50 per share. The transaction was valued at $389 million (Crew Gold Corporation, 2005; Mining Journal, 2005a).

SEMAFO-Guinée operated the Kiniero Mine, which is located about 650 km east of Conakry near the town of Kouroussa. The company was owned by Semafo Inc. of Canada (85%) and the Government (15%). The Kiniero Mine produced about 1,900 kg (reported as 61,416 troy ounces) of gold in 2005 compared with about 1,300 kg (reported as 41,049 troy ounces) in 2004 (Semafo Inc., 2006, p. 9).

Guinea hosted the Mount Nimba and the Simandou iron ore deposits in the southeastern part of the country. The iron content of these banded iron formation deposits was estimated to be between 66% and 68%. Lateritic iron deposits occured in Lowland-Guinea and included the Kaloum Peninsula deposit in Conakry and other deposits in Forecariah. Other iron ore occurrences were identified in Upper-Guinea, Mid-Guinea, and Forested-Guinea (Ministry of Mines and Geology, 2005c).

Guinea's main diamond deposits were located in Kerouane, Kissidougou, and Macenta along the Baoule, the Diani, and the Milo Rivers. Other diamond occurrences were identified in

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Forecariah and Kindia. The country's diamond resources were estimated to be between 25 and 30 million carats. Diamond was mined from alluvial, eluvial, and kimberlite deposits (Ministry of Mines and Geology, 2005b). Guinea was a participant in the Kimberley Process. Artisanal and small-scale mining was mainly concentrated in the Banankoro area in Kerouane, on lands reserved by the Government in the Aredor-FCMC SA concession, and in Kindia. Aredor-FCMC mined along the Boule River and its tributaries and produced on average between 12,000 and 38,000 carats per year. Diamond was exported through the National Bureau of Expertise (BNE), which evaluated the diamond and issued Certificates of Origin in compliance with the Kimberley Process. BNE collected a 3% tax on diamond exports (Ministry of Mines and Geology, 2005b).

Murchison United NL hired SRK Consulting of the United Kingdom to carry out field visits to a number of areas (not identified) in Guinea, Niger, and Mali to determine prospects for uranium mining. SRK completed their visit to Guinea in 2005 and recommended further investigation of the Bohudu, the Firawa, and the Sesse areas within the country. Following SRK's recommendation, Murchison applied for and was granted three prospecting licenses for these areas. Murchison reported that, although it had applied for exploration licenses in Guinea, it would not proceed with an exploration program in the country unless SRK's review of identified areas in Niger and Mali provide significant encouragement (Murchison United NL, 2005, p. 8; 2005§).

Guinea did not produce or refine petroleum. The country was dependent upon imports for its petroleum requirements.

More-extensive coverage of the mineral industry of Guinea can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the Internet at URL http://minerals.usgs.gov/minerals/pubs/country.

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TABLE 1
GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003[e]	2004[e]	2005[e]
Alumina:						
Production:						
Hydrate		--	44	8	10 [r]	10
Calcined		644	680	730	877 [r]	730
Shipments, calcined		644	724	738	887 [r]	740 [3]
Bauxite:						
Mine production:						
Wet basis[4]		17,267	17,480	17,044	17,200	17,300
Dry basis[e, 5]		15,100	15,300	15,000	15,254 [r, 3]	15,200
Calcined		75	--	--	--	--
Shipments (dry basis):						
Metallurgical		13,842	14,087	13,939	14,100 [r]	14,100
Calcined		77	--	--	--	--
Cement		315	360	360	360	360
Diamond[6, 7]	thousand carats	364	491	666	740	550
Gold[7]	kilograms	16,205	16,815	16,622	11,100 [r]	15,300
Salt[e]		15	15	15	15	15

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through August 8, 2006.

[2] In addition to the commodities listed, Guinea produced modest quantities of crude construction materials (clays, sand and gravel, and stone), but information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] Metallurgical ore plus calcinable ore estimated to be 13% water.

[5] Data are for wet-basis ore estimated to be 13% water reduced to dry basis estimated to be 3% water.

[6] Production is approximately 70% to 80% gem quality.

[7] Figures include artisanal production.

TABLE 2
GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Alumina		Alumina Company of Guinea (ACG) [Russian Aluminum Group (RUSAL), 85%, and Government, 15%]	Friguia plan, Fria	780,000.
Bauxite		Compagnie des Bauxites de Guinée (CBG) [Government, 49%, and Halco Mining Inc., 51% (Halco Mining was a consortium formed by Alcoa Inc., 45%; Alcan Inc., 45%; and Dadco Group, 10%)]	Kamsar and Sangaredi	14,000,000.
Do.		Compagnie des Bauxites de Kindia (CBK) [Russian Aluminum Group (RUSAL), 100%]	Debele Mine, Kindia	3,000,000.
Do.		Alumina Company of Guinea [Russian Aluminum Group (RUSAL), 85%, and Government, 15%]	Friguia Mine, Fria	2,800,000.
Cement		Ciments de Guinée (Holcim Ltd., 51%, and Government, 44%)	Conakry plant	360,000.
Diamond	carats	Aredor-First City Mining Company (Government, 15%, and Trivalence Mining Corporation, 85%)	Aredor Mine	38,000.
Do.	do.	Artisanal miners	Mainly in Banankoro	700,000.
Gold		Société Ashanti de Guinée (AnglogoldAshanti Ltd., 85%, and Government, 15%)	Siguiri Mine	9,000,000 ore; 9,300 gold.
Do.		Société Minière de Dinguiraye (Guinor, 85%, and Government, 15%)	Lero-Karta Mine	1,100,000 ore; 3,500 gold.
Do.		Société d'Exploitation Minière d'Afrique de l'Ouest Guinée (Semafo Inc., 85%, and Government, 15%)	Kiniero Mine	400,000 ore; 1,700 gold.

THE MINERAL INDUSTRY OF KENYA

By Thomas R. Yager

The mineral industry in the East African country of Kenya was noted chiefly for its production of fluorspar and soda ash. Other industrial minerals produced in recent years included bentonite, diatomite, feldspar, gypsum, kaolin, and silica sand. Building materials produced included cement, granite, limestone, marble, and shale. Kenya produced small amounts of gold, iron ore, lead, secondary aluminum and steel. The country also produced carbon dioxide gas, lime, gemstones, and refined petroleum products (table 1).

In 2005, Kenya's real gross domestic product (GDP) increased by 4.7% after rising by 4.3% in 2004. The nominal GDP was about $48 billion based on purchasing power parity; the per capita GDP based on purchasing power parity was about $1,400. In 2005, manufacturing accounted for 10.5% of the GDP; building and construction, 4%; electricity and water, 2%; and mining and quarrying, less than 1% (Central Bank of Kenya, 2006b, p. 19; International Monetary Fund, 2006§[1]).

The mining and quarrying sector grew by 2.7% in 2005 compared with 2.2% in 2004 and 3.5% in 2003. Growth in 2005 was attributable to higher production of soda ash and carbon dioxide, ruby, sapphire, and tourmaline. The manufacturing sector grew by 5% in 2005; building and construction, 7.2%; and electricity and water, 0.1% (Central Bank of Kenya, 2006b, p. 19).

Commodity Review

Metals

Gold.—Artisanal miners produced gold in the Nyanza, the Rift Valley, and the Western Provinces. National exports of gold amounted to 616 kilograms (kg) in 2005 compared with 567 kg in 2004 and 1,545 kg in 2001. Gold accounted for 11% of the value of Kenya's mineral exports in 2005. Kansai Mining Corp. of Canada and Mid Migori Mining Company Ltd. were engaged in a joint venture to explore for gold in the Migori District of Nyanza Province. AfriOre Ltd. of South Africa explored for gold in the Siaya District of Nyanza Province and the Kakamega District of Western Province. International Gold Exploration AB of Sweden had properties in the Nyanza and the Rift Valley Provinces; the company sought joint-venture partners for gold exploration (E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

Iron and Steel.—Kenya's four rolling mills had a capacity of 220,000 metric tons per year (t/yr) and relied upon imported billet; the capacity of the country's three galvanized steel plants amounted to 210,000 t/yr. In 2005, national production of galvanized sheets increased to 175,700 metric tons (t) from 157,600 t in 2004 and 137,200 t in 2003 (Central Bureau of Statistics, 2006). The International Iron and Steel Institute (2005, p. 84) estimated that Kenya's apparent consumption of finished steel increased to 507,000 t in 2004 from 442,000 t in 2003 and 359,000 t in 1999.

Titanium and Zirconium.—Tiomin Resources Inc. of Canada held licenses for the Kilifi, the Kwale, the Mambrui, and the Vipongo heavy mineral sands deposits. The company planned to mine at Kwale; Tiomin expected to begin the 20-month construction phase in early 2006. Tiomin was expected to produce 330,000 metric tons per year (t/yr) of ilmenite, 75,000 t/yr of rutile, and 40,000 t/yr of zircon. By the end of November 2005, Tiomin had negotiated contracts for the purchase of all the rutile and zircon and about two-thirds of the ilmenite to be produced over the expected 11-year life of the mine (Tiomin Resources Inc., 2005a, b).

Industrial Minerals

Carbon Dioxide.—Carbacid Ltd. produced natural carbon dioxide gas in the Kaimbu District. In 2005, production was 8,723 t compared with 5,982 t in 2004 and 5,645 t in 2001. The company supplied domestic and export markets; consumers included beer and soft drink manufacturers (E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

Cement.—In 2005, Kenya had three cement producers with a combined capacity of 2.82 million metric tons per year (Mt/yr). National cement production increased to 2.12 Mt in 2005 from 1.79 Mt in 2004 and 1.66 Mt in 2003. Production at Bamburi Cement Ltd. was limited by the capacity of the company's clinker plant. East African Portland Cement Co. Ltd. (EAPC) produced at a rate of 600,000 t/yr in 2005; the company planned an expansion that would increase its production to 1 Mt/yr. The expansion was expected to be completed in 2007 at a cost of $11 million. Athi River Mining Ltd. (ARM) produced at a rate of 120,000 t/yr in 2005; the company planned to increase its capacity to 300,000 t/yr by early 2006 (Mulunda, 2005; Central Bank of Kenya, 2006a, p. 19; Swan and Klotnick, undated).

In 2004, Bamburi had a 57% share of the domestic cement market; EAPC, 35%; and ARM, 7%. In 2005, Kenya's cement consumption amounted to about 1.57 Mt compared with nearly 1.42 Mt in 2004; the increase was partially attributable to growth in the residential construction sector (Central Bank of Kenya, 2006a, p. 21; Swan and Klotnick, undated).

Fluorspar.—Kenya Fluorspar Ltd. produced acid-grade fluorspar in the Keiro Valley for export markets. Exports amounted to 109,594 t in 2005 compared with 117,986 t in 2004 and 118,850 t in 2001. In 2005, the value of fluorspar exports was $1.45 million, or 17% of mineral exports (E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

Gemstones.—Kenya produced gemstones that included amethyst, aquamarine, cordierite, green garnet (tsavorite), ruby, sapphire, and tourmaline. The production of amethyst, aquamarine, and cordierite declined in 2005 (table 1). Gemstones accounted for about 1% of the reported value of Kenya's mineral production (E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Rockland Kenya Ltd., which operated the John Saul ruby mine, was the leading producer and exporter of ruby. Ruby and pink sapphire were discovered near Baringo in July 2005. Small amounts of sapphire were also mined at Garba Tula and Takana. National ruby production increased to an estimated 5,100 kg in 2005 from 4,758 kg in 2004, and sapphire, to an estimated 3,500 kg from 2,000 kg in 2004 (Austin and others, 2005).

The Scorpion Mine increased production of tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, to between 3 and 4 kilograms per month (kg/mo) with the discovery of new resources at the mine. National production of green garnet, however, declined to an estimated 800 kg in 2005 from 1,603 kg in 2004. A deposit of color-change garnet was discovered near Taita Taveta in late 2004; production amounted to less than 1 kg/mo (Austin and others, 2005).

Salt.—Magadi Soda Ash Ltd. (a subsidiary of Brunner Mond Group Ltd.) extracted salt from Lake Magadi as a byproduct of the soda ash production process. Output from Lake Magadi was 26,595 t compared with 31,139 t in 2004. Salt producers on the Indian Ocean coast included Kema Salt Ltd., Kensalt Ltd., Kurawa Salt Ltd., Krystalline Salt Ltd., Malindi Salt Works, and Mombasa Salt Works Ltd. National salt production was estimated to be 60,000 t in 2004 and 52,000 t in 2005 (E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

Soda Ash.—Magadi mined trona from Lake Magadi. The production of soda ash increased to 360,161 t in 2005 from 355,380 t in 2004 and 297,780 t in 2001. Magadi's production of soda ash and crushed refined soda accounted for 77% of the value of Kenya's mineral production in 2005. The company was building a new processing plant that would increase production capacity to 715,000 t/yr from 350,000 t/yr. The plant was expected to be completed in mid-2006 at a cost of $98 million (Brunner Mond Group, 2004, 2006; E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

From 2001 through 2005, about 90% of Kenya's soda ash production was exported. In 2005, the value of soda ash exports amounted to $5.26 million, or 63% of mineral exports. Soda ash was consumed domestically by ARM in the production of sodium silicate, which was used in detergents, soaps, and chemical and metallurgical applications. ARM accounted for about 70% of sodium silicate sales in East Africa (Swan and Klotnick, undated; E.S. Osumo, Mines and Geology Department, written commun., July 7, 2006).

Mineral Fuels

Petroleum.—Kenya Petroleum Refineries Ltd. (KPRL) produced refined petroleum products from imported crude petroleum. In 2005, the company's output of refined petroleum products decreased by about 4% (table 1). KPRL supplied most of the residual fuel oil; about 65% of the diesel, gasoline, and kerosene; and about 60% of the liquefied petroleum gas (LPG) consumed in Kenya. The company planned to upgrade the refinery to increase LPG production to nearly 1.2 million barrels per year (Senelwa, 2005).

A joint venture of Woodside Energy Ltd. of Australia (50%), Dana Petroleum plc (30%), and Star Petroleum International (Kenya) Ltd. (20%) [a subsidiary of Global Petroleum Ltd. of Australia] was engaged in natural gas and petroleum exploration at offshore Blocks L5 and L7. Exploration wells were expected to be drilled in these properties in 2006. Afrex Ltd. and Pancontinental Oil and Gas NL of Australia had a joint-venture agreement for exploration in offshore Blocks L6, L8, and L9. In February 2005, Pancontinental's board of directors reached an agreement with Afrex's shareholders for the purchase of Afrex by Pancontinental (Pancontinental Oil and Gas NL, 2005; Dana Petroleum plc, 2006).

Infrastructure

The state-owned Kenya Electricity Generating Co. Ltd. (Kengen) generated most of Kenya's electric power. Kengen planned to complete construction of the 60-megawatt (MW) Sondu Miriu hydroelectric plant by the end of 2007. A proposed second phase would add 21 MW of capacity at Sondu Miriu. The costs of the first phase were estimated to be $128 million, and the second phase, about $55 million. In 2005, the European Investment Bank agreed to loan $39.7 million to Kengen for the expansion of the Olakaria II geothermal plant. The plant's capacity was expected to increase to 105 MW from 70 MW. Kengen planned to sell 30% of its shares on the Nairobi Stock Exchange by the end of the first quarter of 2006 (Kenya Electricity Generating Co. Ltd., 2005b; Ochieng, 2005).

Kenya produced 5,519 gigawatthours (GWh) of electricity in 2005, which was an increase of 9.7% compared with that of 2004. In 2005, hydroelectric sources accounted for 54.5% of the country's total supply of electricity; thermal, 27.3%; and geothermal, 18.3%. Electricity consumption increased by 6.8% in 2005. Peak power demand amounted to 920 MW of capacity in July 2005 compared with 830 MW in July 2004 and 785 MW in July 2003. By July 2008, peak power demand was expected to increase to 1,370 MW of capacity (Kenya Electricity Generating Co. Ltd., 2005a; Central Bank of Kenya, 2006a, p. 19).

Outlook

Kenya's GDP was forecasted to grow by 3.3% in 2006 and 4.9% in 2007. Cement demand was likely to increase because of higher Government expenditures on residential and road construction. The Government planned to spend nearly $180 million on road construction in fiscal year 2005-06, which was an increase of 300% compared with that of fiscal year 2004-05. If the recent broad-based increase in world minerals demand continues, the outlook for Kenyan production of fluorspar, soda ash, and titanium minerals is likely to be positive (Mulunda, 2005; International Monetary Fund, 2006§).

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TABLE 1
KENYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002[e]	2003[e]	2004[e]	2005[e]
Aluminum, secondary		2,400 [e]	2,400	2,400	2,400	2,400
Carbon dioxide gas, natural		5,645	5,662 [3]	4,614 [r, 3]	5,982 [r, 3]	8,723 [3]
Cement, hydraulic	thousand metric tons	1,319	1,463 [3]	1,658 [3]	1,789 [3]	2,123 [3]
Clays:						
Bentonite		50	50	50	50	60
Kaolin		700	720 [r]	740 [r]	760 [r]	780
Other		18,000	18,000	19,000	20,000 [r]	20,000
Diatomite[4]		441	1,333 [3]	353 [3]	330 [r, 3]	243 [3]
Feldspar		73	60 [r]	50 [r]	40 [r]	22 [3]
Fluorspar, acid grade[4]		118,850	85,015 [3]	95,278 [3]	117,986 [r, 3]	109,594 [3]
Gemstones, precious and semiprecious:						
Amethyst[4]	kilograms	800 [r, e]	500 [r]	300 [r]	82 [r, 3]	73 [3]
Aquamarine[4]	do.	180 [r, e]	230 [r]	280 [r]	331 [r, 3]	250
Cordierite, iolite[4]	do.	230 [r, e]	190 [r]	140 [r]	92 [r, 3]	81 [3]
Green garnet	do.	1,600 [r, e]	1,100 [r]	600 [r]	1,603 [r, 3]	800
Ruby	do.	5,862	3,043 [3]	2,310 [r, 3]	4,758 [r, 3]	5,100
Sapphire	do.	3,400 [r, e]	1,800 [r]	1,400 [r]	2,000 [r]	3,500
Tourmaline	do.	15,000 [r, e]	11,000 [r]	7,000 [r]	4,000 [r]	8,000
Gold, mine output, Au content[4]	do.	1,545	1,477 [3]	1,543 [3]	567 [r, 3]	616 [3]
Gypsum and anhydrite		8,200	8,400 [r]	8,700 [r]	8,900 [r]	9,100
Iron ore		920	900 [r]	700 [r]	500 [r]	300 [3]
Lead, refined secondary		1,000	1,000 [3]	1,000 [3]	1,000 [3]	1,000 [3]
Lime		50,000 [r, e]	50,000 [r]	50,000 [r]	90,000 [r]	90,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	2,329	2,158 [3]	2,243 [r, 3]	2,346 [r, 3]	2,200
Kerosene and jet fuel	do.	2,518	2,148 [3]	2,298 [r, 3]	2,416 [r, 3]	2,300
Distillate fuel oil	do.	3,253	3,021 [3]	3,066 [r, 3]	2,887 [r, 3]	2,800
Residual fuel oil	do.	3,563	3,550 [3]	3,490 [r, 3]	4,129 [r, 3]	4,000
Liquefied petroleum gas	do.	325	278 [3]	499 [r, 3]	313 [r, 3]	300
Other	do.	110 [e]	100	110 [r]	110 [r]	100
Total	do.	12,100 [e]	11,300	11,700 [r]	12,200 [r]	11,700
Salt, crude		33,000 [r, e]	46,000 [r]	48,000 [r]	60,000 [r]	52,000
Soda ash		297,780	304,110 [3]	352,560 [3]	353,835 [r, 3]	360,161 [3]
Stone, sand and gravel:						
Granite for dimension stone		180 [e]	180	190	200 [r]	200
Limestone for cement	thousand metric tons	640 [e]	710	800	870 [r]	1,000
Limestone for dimension stone		32,000	32,000 [3]	33,000	34,000	35,000
Marble for dimension stone		120 [e]	120	130	130	130
Sand, industrial; glass		12,000 [e]	12,000	13,000	13,000	13,000
Shale		190,000 [e]	190,000	200,000	210,000 [r]	210,000
Sulfuric acid		20,000	20,000 [3]	20,000 [3]	20,000	20,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through November 9, 2006.

[2] In addition to the commodities listed, a variety of minerals and construction materials [brick clays, coal, gravel, meerschaum, mica, murram (latei crushed rock, and construction sand] may be produced, but quantities are not reported, and available information is inadequate to make estimates c

[3] Reported figure.

[4] Exports.

TABLE 2
KENYA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Carbon dioxide gas, natural		Carbacid Ltd.	Mine at Kereita	10,000.[e]
Cement		Bamburi Cement Ltd.	Plant at Mombasa	1,100,000.
Do.		do.	Plant at Nairobi	1,000,000.
Do.		East African Portland Cement Co. Ltd. (EAPC)	Plant at Athi River	600,000.
Do.		Athi River Mining Ltd. (ARM)	Plant at Kaloleni	120,000.
Diatomite		African Diatomite Industries Ltd.	Kariandusi and Soysambu	4,000.
Fluorspar		Kenya Fluorspar Ltd.	Mine at Kerio Valley	120,000.
Garnet	kilograms	Bridges Exploration Ltd	Scorpion Mine in Taita Taveta	40.
Glass		Central Glass Industries Ltd.	Plant at Nairobi	51,100.
Do.		Impala Glass Industries Ltd.	do.	NA.
Gold	kilograms	Artisanal miners	Mines in Nyanza, Rift Valley, and Western Provinces	NA.
Lead, refined secondary		Associated Battery Manufacturers Co. Ltd.	Plant at Athi River	3,000.
Lime		Athi River Mining Ltd.	Plant at Kaloleni	75,000.
Do.		Homa Lime Company Ltd	Plant at Koru	30,000.
Petroleum, refined	thousand 42-gallon barrels	Kenya Petroleum Refineries Ltd. [Government, 50%; British Petroleum plc, Caltex Oil (Kenya) Ltd., and Royal Dutch/Shell Group, 50%]	Refinery at Mombasa	32,850.
Ruby	kilograms	Rockland Kenya Ltd.	Mine at Kasigau	1,500.[e]
Salt		Magadi Soda Ash Ltd. (Brunner Mond Group Ltd., 100%)	Mine at Magadi	40,000.
Do.		Krystalline Salt Ltd.	Mine at Nairobi	NA.
Do.		Mombasa Salt Works Ltd.	Mine at Mombasa	NA.
Soda ash		Magadi Soda Ash Ltd.	Mine at Magadi	350,000.
Sodium silicate		Athi River Mining Ltd.	Plants at Athi River and Kalol	40,000.
Steel:[1]				
Crude[2]		Kenya United Steel Co. Ltd. (E.A. Wire Industries Ltd., 81%)	Plant at Mombasa	20,000.
Rolled		Mabati Rolling Mills Ltd.	do.	120,000.
Do.		Standard Rolling Mills Ltd.	do.	40,000.
Do.		Kenya United Steel Co. Ltd.	do.	30,000.
Do.		Steelmakers Ltd.	do.	30,000.
Sulfuric acid		Kel Chemicals Ltd.	Plant at Thika	32,000.
Do.		East African Heavy Chemicals	Plant at Webuye	NA.
Vermiculite[3]		Kenmag Investments Ltd.	Mine at Lodosoit	2,000.

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] In addition to its crude and rolled steel facilities, Kenya has three galvanized steel plants with a capacity of 210,000 metric tons per year.

[2] Has not operated since 1998.

[3] Has not operated since 2000.

THE MINERAL INDUSTRY OF LESOTHO

By Thomas R. Yager

The Kingdom of Lesotho is a landlocked country that is completely surrounded by South Africa. The country was a producer of clays, diamond, crushed and dimension stone, and sand and gravel (table 1). In fiscal year 2004-05, manufacturing accounted for 17% of the gross domestic product; construction, 14%; electricity and water, 4%; and mining and quarrying, less than 1%. Exports of minerals and mineral products accounted for less than 1% of total exports in 2004 (International Monetary Fund, 2005, p. 31, 56).

Letseng Diamonds (Pty) Ltd. [Matodzi Resources Ltd. of South Africa and JCI Ltd. of South Africa, 38% each, and the Government of Lesotho, 24%] operated the Letseng la Terae diamond mine. In fiscal year 2004-05, the company produced 37,000 carats of diamond at a value of $44.4 million. The company planned to produce slightly more than 50,000 carats in fiscal year 2005-06. A new plant that would double capacity to 100,000 carats per year was expected to be completed by 2007 (Muller, 2005).

In September 2005, European Diamonds plc completed the diamond recovery plant at the Liqhobong diamond mine. The company held a mining license for the Satellite Pipe at Liqhobong and an exclusive prospecting license for the nearby Main Pipe. European Diamonds planned to reach full capacity by the end of 2005 and to produce 290,000 carats of diamond in 2006 (European Diamonds plc, 2005a, p. 4; 2005b).

Diamond production was likely to rise in 2006, but the outlook for the remainder of Lesotho's mineral industry was for little change in the near future. Limited natural resources and high rates of HIV/AIDS infection among Lesotho's population were likely to constrain development of the mining sector.

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TABLE 1
LESOTHO: PRODUCTION OF MINERAL COMMODITIES[1, 2]

Commodity		2001	2002	2003	2004[e]	2005[e]
Diamond	carats	1,140	721	2,099	14,000 [r]	37,000 [3]
Fire clay	cubic meters	34,000	42,000	14,470	15,000	15,000
Stone, quarry products:						
Dimension stone	square meters	13,357	29,766	1,089	1,000	1,000
Gravel and crushed rock	cubic meters	180,000	261,037	389,695	300,000	300,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.

[1]Table includes data available through October 4, 2006.

[2]Data are for the financial year ending in April.

[3]Reported.

THE MINERAL INDUSTRY OF LIBERIA

By Omayra Bermúdez-Lugo

The Republic of Liberia continued to recover from civil war and political instability. A new Government was elected in October 2005 (United Nations Mission in Liberia, 2005a, b). The Ministry of Lands, Mines, and Energy reported that the new Government was committed to setting effective policy guidelines to assist in the country's economic reconstruction and, to this effect, the Ministry was in the process of formulating new energy, mineral, land, and water policies (Eugene H. Shannon, Minister of Lands, Mines, and Energy, written commun., July 18, 2006).

According to the U.S. Department of State (2006§[1]) prior to Liberia's civil conflicts, mining was the most important sector of the economy and accounted for about two-thirds of the country's exports; iron ore production accounted for about one-half of the Government's revenues. In 2005, mining was limited to the production of cement, gold, crushed stone, and sand. The Government enacted a voluntary ban on the issuance of alluvial diamond mining licenses. In June 2005, the United Nations Security Council renewed sanctions on the export of diamond from Liberia, citing both the lack of transparency in a contract between the National Transitional Government of Liberia and West Africa Mining Corporation and the country's inability to implement the Kimberley Process Certification Scheme. U.S. Department of State (2006§) reports indicate that the infrastructure that had supported the iron ore mines was either looted during the civil war or decayed as a result of neglect; therefore, all iron ore mines remained closed during the year.

More-extensive coverage of the mineral industry of Liberia can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
LIBERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005 [2]
Cement, hydraulic		62,897	53,622	25,000 [e]	40,000 [e]	40,000 [e]
Diamond[e]	carats	170,000	80,000	40,000	10,000	10,000 [e]
Gold[e]	kilograms	57	42	20	110 [r, 2, 3]	16 [3]
Sand		NA	NA	NA	213,892 [2, 3]	222,274 [3]
Stone, crushed		NA	NA	NA	NA	5,964 [3]

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. NA Not available.

[1] Table includes data available through July 26, 2006.

[2] Reported figure.

[3] Source: Ministry of Lands, Mines, and Energy of Liberia.

THE MINERAL INDUSTRY OF LIBYA

By Philip M. Mobbs

The hydrocarbon sector dominated Libya's economy. The predominately state-controlled economy lacked substantial diversification; natural gas and petroleum operations accounted for about 93% of Government revenue in 2005 compared with about 87% in 2004 and 68% in 2001, although much of the increase could be attributed to the increase in world oil prices and not increased production. Libyan crude oil exports prices averaged $53.70 per barrel in 2005, $36.90 in 2004, and $23.20 in 2001. Hydrocarbons accounted for more than 95% of export revenues. The gross domestic product (GDP) based on purchasing power parity was estimated to be $67 billion in 2005, and the GDP per capita based on purchasing power parity was $11,624 (International Monetary Fund, 2006, p. 27, 29, 30; 2006§[1]).

Libya was Africa's third leading oil producer and the 17th ranked producer internationally. Most of the produced oil was exported. Libya's oil reserves ranked the country 10th worldwide, but international sanctions, most of which were rescinded between September 2003 and September 2004, had adversely impacted oilfield exploitation and downstream operations. Other Libyan mineral and mineral-based commodity production included ammonia, cement, clay, direct-reduced and hot-briquetted iron, dolomite, gypsum, limestone, lime, methanol, salt, sand, steel, stone, sulfur, and urea (BP p.l.c., 2006, p. 6, 8).

Commodity Review

Metals

Iron and Steel.—Libyan Iron and Steel Co. proposed to expand the direct-reduced iron capacity of its plant at Misurata to 1.6 million metric tons per year (Mt/yr) from 1.1 Mt/yr, and the raw steel capacity, to 3 Mt/yr from about 1.3 Mt/yr (Libyan Iron and Steel Co., 2006§).

Industrial Minerals

Cement.—The February 2005 initial public offering of shares in the formerly Government-owned Arab Cement Co. (ACC) resulted in the sale of 60% of the company. ACC proposed to build a second 1-Mt/yr-capacity cement production line at its Zliten plant. Arab Union Contracting Co. (AUCC) commissioned a 1.2-Mt/yr-capacity cement clinker plant near Zliten in December 2004; commercial production began in September 2005. AUCC began a feasibility study for the construction of a second clinker production line at its production facility (Middle East Economic Digest, 2005b).

Mineral Fuels

Natural Gas.—Most natural gas production in Libya was associated with crude oil production. In August 2005, Eni S.p.A. of Italy and National Oil Corp. (NOC) began initial production from the Bahr Essalam Field, which is located in offshore Block NC-41. Natural gas production from the Bahr Essalam and the Wafa Fields was treated at the Mellitah plant; much of the output was shipped through the Greenstream pipeline to Gela, Sicily.

The Royal Dutch/Shell Group and NOC agreed to refurbish the 700,000-metric-ton-per-year-capacity liquefied natural gas (LNG) facility at Marsa al-Brega, which was operated by Sirte Oil Co. for Production and Processing of Oil and Gas (a subsidiary of NOC). Rehabilitation of the LNG plant was to be followed by a capacity expansion to 3.2 Mt/yr (Middle East Economic Digest, 2005a).

Petroleum.—Negotiations for the return of the Oasis Group (comprised of Amerada Hess Corp, ConocoPhillips, and Marathon Oil Corp.) continued until late December, when Oasis and NOC agreed to a 25-year extension of the Group's exploration and production agreements on the Waha concessions in the Sirte Basin. State-owned Waha Oil Co. had operated the Sirte Basin fields since the Group had been obligated to leave Libya as a result of sanctions imposed by the United States under Executive Order 12543 of January 7, 1986. The original concession agreements had expired during the hiatus. The new agreement called for the Oasis Group to pay $1.3 billion for their resumption of management of the oilfields and for the concession extension and $530 million to partially refund investments in the operation made by Waha Oil (Amerada Hess Corp., 2005; Jones, 2005§).

In July, Occidental Petroleum Corp. (Oxy) and NOC agreed that Oxy could resume production operations on the three concession areas that U.S. sanctions had forced Oxy to leave in 1986. The original concession agreements will expire in 2009 and 2010. State-owned Zueitina Oil Co. had managed the concessions since 1986.

In early 2005, exploration permits were awarded for nine onshore and six offshore blocks that were offered in the initial round of bids for licenses under the Exploration and Production Sharing Agreement-IV (EPSA-4). In October, the second round of bids under EPSA-4 resulted in the awarding of exploration permits on 24 onshore and 16 offshore blocks. Additional licensing rounds for exploration permits were scheduled to be held in 2006 and 2007.

Outlook

International demand for oil and the termination of economic sanctions by the United States in 2004 and the United Nations in 2003 were expected to significantly assist in the revival of the Libyan hydrocarbon sector, especially the refining and

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[1] References that include a section mark (§) are found in the Internet References Cited section.

secondary recovery segments. The Government proposed to increase national oil production to about 750 million barrels per year by 2007 and to more than 1 billion barrels per year by 2010, subject to production quotas imposed by the Organization of the Petroleum Exporting Countries. The petroleum sector was the focus of most of the foreign direct investment received by Libya (Petroleum Economist, 2006; Alexander's Gas & Oil Connections, 2006§).

The Government's proposed transformation from a centrally planned to an open-market economy included economic reforms; increased job creation; privatization (or liquidation) of 360 state-owned companies; the promotion of the agriculture, construction, manufacturing, mining, tourism, and transportation sectors; reduction of subsidies; and reorganization of the banking system. The transformation of the national economy, however, proved unpopular. Sixty-six small companies were privatized. As the subsidiary reduction program was initiated in May, gasoline prices rose by 30%, diesel fuel prices rose by 6%, and electricity prices soared. The pace of the economic diversification program was expected to slow dramatically in 2006.

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TABLE 1
LIBYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
Cement, hydraulic[e]		3,000	3,300	3,500 [r]	3,600 [r]	3,600
Gas, natural:						
Gross	million cubic meters	13,700 [r]	13,100 [r]	14,000 [r]	14,900 [r]	15,000
Dry	do.	11,500 [r]	11,100 [r]	10,300 [r]	10,700 [r]	11,700
Gypsum[e]		150	150	150	175	175
Iron and steel, metal:						
Direct-reduced iron[3]		1,090	1,170	1,340	1,580 [4]	1,650 [4]
Crude steel		846	886	1,007	1,026 [4]	1,260 [4]
Lime[e]		250	250	250	250	250
Methanol		570	680	727	670 [r]	610
Nitrogen:						
N content of ammonia		495	533	577	577	580
N content of urea		365	400	425	425	425
Petroleum:						
Crude[e]	thousand 42-gallon barrels	520,000	502,000	543,000	587,000	620,000
Refinery products:						
Liquefied petroleum gas	do.	1,900	1,400	2,300	2,200 [r]	2,300
Gasoline	do.	6,500	6,100	7,300	5,600 [r]	6,000
Naphtha	do.	19,900	19,300	21,200	11,200 [r]	20,000
Kerosene and jet fuel	do.	12,000	11,800	12,400	20,300 [r]	12,500
Distillate fuel oil	do.	27,900	25,000	28,100	28,700 [r]	28,500
Residual fuel oil	do.	40,300	39,200	41,600	42,800 [r]	42,500
Total	do.	108,500	102,800	112,900	110,800 [r]	112,000
Salt[e]		40	40	40	40	40
Sulfur, byproduct of petroleum and natural gas[e]		15	15	15	15	16

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through October 2006.

[2] In addition to the commodities listed, a variety of clay, dolomite, limestone, sand, and crushed construction stone was produced, and natron (soda ash) may have been produced, but available information is inadequate to make estimates of output. Natural gas liquids also were produced but were blended with crude petroleum and reported as part of that total.

[3] Includes hot-briquetted iron.

[4] Reported figure.

THE MINERAL INDUSTRY OF MADAGASCAR

By Thomas R. Yager

The Republic of Madagascar is an island located about 420 kilometers (km) east of Mozambique in the Indian Ocean. Madagascar had an area of 587,040 square kilometers (km^2) and a population of more than 18 million in 2005. Its mining industry was chiefly noted for the production and export of chemical- and metallurgical-grade chromite ore, high-quality crystalline flake graphite, and precious, semiprecious, and ornamental gemstones. In addition to these minerals, small quantities of beryllium and gold and such industrial mineral commodities as cement, feldspar, quartz, and salt were produced. Madagascar was also known to have resources of bauxite, coal, cobalt, copper, lead, manganese, nickel, platinum, tin, titanium, zinc, and zirconium.

In 2005, Madagascar's nominal gross domestic product (GDP) based on purchasing power parity amounted to about $16.2 billion. Madagascar's real GDP increased by 4.6% in 2005 compared with 5.3% in 2004. The manufacturing sector accounted for about 10% of the real GDP; energy, 1%; and mining and construction materials, less than 1% (Ministère de l'Economie, des Finances et du Budget, 2005, p. 131; International Monetary Fund, 2006§[1]).

In 2005, real output in the mining sector was estimated to have grown at a rate of 4% compared with 8% in 2004 and 10% in 2003. The construction materials sector grew by 6% in 2005, and the energy sector, by 5% (Ministère de l'Economie, des Finances et du Budget, 2005, p. 102).

Government Policies and Programs

In February 2005, the Government enacted legislation that permitted foreign buyers to purchase and export gemstones from Madagascar. Under the new legislation, a business license was required to be purchased at a cost of $100 to export gemstones. Export taxes on rough gemstones were 2%; cut gemstones could be exported tax free. Prior to the passage of the legislation, it was illegal for foreign buyers to purchase gemstones without forming a locally registered company (Colored Stone, 2005).

Commodity Review

Metals

Chromium.—The state-owned company Kraomita Malagasy (KRAOMA) produced chromite concentrates with a content of between 48% and 49% Cr_2O_3 and lumpy ore with a content of between 42% and 43% Cr_2O_3 from its mines at Ankazotaolana and Bemanevika. The company exported its output to China, Japan, and Sweden. In 2005, chromite production increased to an estimated 140,000 metric tons (t) compared with 77,386 t in 2004 and 45,040 t in 2003 because of increased demand from China. KRAOMA restarted production at the Bemanevika Mine in October 2005 because of the impending resource depletion at Ankazotaolana. Reserves at Bemanevika and Ankazotaolana were estimated to be 3 million metric tons (Mt) and 750,000 t of ore, respectively (Andrianatenaina, 2005b).

Cobalt and Nickel.—The Ambatovy nickel laterite deposits are located in eastern Madagascar. In March 2005, Dynatec Corp. of Canada and its joint-venture partner Phelps Dodge Corp. of the United States completed a feasibility study on developing the Ambatovy nickel and cobalt project. Starting by the end of 2008, the companies planned to mine two deposits that had combined reserves of 125 Mt at grades of 1.04% nickel and 0.1% cobalt. After the end of the 20-year life of the mine, Dyantec and Phelps Dodge expected to process 39.4 Mt of additional stockpiled ore at grades of 0.69% nickel and 0.064% cobalt (Mining Journal, 2005a).

Lateric slurry from the ore-processing plant was to be transported by a 195-km pipeline to a pressure-acid-leaching plant at Toamasina. The plant was expected to produce a sulfide product that contained 55.2% nickel and 4.2% cobalt. The sulfide product would be processed at a refinery with a capacity of 60,000 metric tons per year (t/yr) of refined nickel and 5,600 t/yr of cobalt. The capital cost of the mine, pipeline, processing plants, refinery, power supply, and port facilities was estimated to be $2.25 billion (Mining Journal, 2005a).

Dynatec agreed in early 2005 to acquire Phelps Dodge's interest in Ambatovy. Impala Platinum Holdings Ltd. (Implats) of South Africa agreed in June to form a joint venture with Dynatec to develop the Ambatovy project, and Sumitomo Corp. of Japan joined the partnership in August. Dynatec and Implats each held 37.5% of the project, and Sumitomo, 25%. In December, Implats withdrew from the project because of rising costs in the mining industry. Dynatec and Sumitomo were expected to seek new joint-venture partners for the project (Mining Journal, 2005b).

Diamond Fields International Ltd. of South Africa held the Valozoro nickel laterite deposit. Valozoro, which is located in south-central Madagascar, had resources of 3.7 Mt at a grade of 1.75% nickel. The company also engaged in exploration at its recently acquired Jango property, which is located northwest of Antananarivo, and ceased exploration activities at other properties in 2005 (Diamond Fields International Ltd., 2006, p. 11).

Copper and Platinum-Group Metals.—In 2005, Jubilee Platinum plc of the United Kingdom signed an agreement with BHP Billiton Ltd. of Australia to conduct a geophysical survey of Jubilee's Ambodilafa copper-nickel sulfide property. The company also conducted a geophysical survey at the Lanjanina copper property. In the second half of 2005, Jubilee started drilling at the Antsahabe and the Lavatrafo copper-nickel-platinum-group-metals properties, which make up the Londokomanana project. Drilling was expected to start at Ambodilafa and Lanjanina in 2006 (Jubilee Platinum plc, 2006).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Gold.—Artisanal miners produced gold at numerous deposits in Madagascar, which included those at Ampanihy and Maevatanana in the east and Andavakoera in the northeast. Golden Deeps Ltd. of Australia explored for gold at the Kelimaizina gold prospect in north-central Madagascar. In November 2005, Golden Deeps acquired the Antanimbary property, which is located about 200 km northwest of Antananarivo. The company engaged in soil sampling at Antanimbary. Pan African Mining Corp. of Canada explored at its Mountain of Gold property in the Dabolava region of the Central-West Plateau; the company planned to start a drilling program in January 2006 (Pan African Mining Corp., 2005b; Golden Deeps Ltd., 2006).

Titanium and Zirconium.—In August 2005, Rio Tinto plc of Australia announced plans to proceed with its mineral sands joint-venture project at Mandena in southeastern Madagascar [QIT Fer et Titane of Canada (a subsidiary of Rio Tinto plc), 80%, and the Government of Madagascar, 20%]. Following the startup of construction in the fourth quarter of 2005, ilmenite shipments were expected to begin in the third quarter of 2008. Rio Tinto planned to produce 750,000 t/yr of ilmenite by 2012; production could rise to 2 million metric tons per year in future phases of the project. The construction cost of the mine and processing facilities was estimated to be $440 million, and of a new port at Ehola, $145 million. The company also planned to spend $190 million to upgrade its plant at Sorel in Quebec, where the ilmenite from Mandena would be smelted. Reserves at Mandena were 75 Mt of contained ilmenite with a TiO_2 content of 60%; the life of the mine was expected to be at least 40 years (Mining Journal, 2005c).

Kumba Resources Ltd. of South Africa and Ticor Ltd. of Australia were engaged in a feasibility study on the Toliara mineral sands deposit. The companies planned to complete the study by the end of 2006 at a cost of about $5 million. The life of the proposed mine was estimated to be more than 30 years if the feasibility study yielded favorable results; ilmenite from Toliara would be exported to South Africa for smelting (Ticor Ltd., 2005).

Industrial Minerals

Cement.—National cement production increased to an estimated 180,000 t in 2005 from 51,882 t in 2001. In spite of higher production, cement prices increased sharply from 2003 to 2005 because of increases in demand. In 2004, Madagascar's consumption of cement increased to nearly 500,000 t compared with 424,000 t in 2003. Higher consumption was attributable to such public works projects as schools and roads (Andrianatenaina, 2005a; Rakotomalala, 2005a).

Holcim (Madagascar) S.A. and Nouvelle Cimenterie Amboanio, which was 66% owned by the Lafarge Group of France, operated two cement plants with capacities of 150,000 t/yr and 40,000 t/yr, respectively (table 2). Holcim planned to increase the capacity at the Ibity plant to 200,000 t/yr by February 2007 (Rampanjato, 2005a).

Madagascar Long Cimenterie (MLC) of China planned to complete a new cement plant at Ambohimanambola by June 2006 that would produce 250,000 t/yr. MLC initially planned to produce cement from imported clinker; the company indicated that a limestone quarry could be opened at Antsirabe in the future (Rakotomalala, 2005b).

Diamond.—Majescor Resources Inc. of Canada and its joint-venture partner Madagascar Mining Development of Madagascar explored for diamond at the former company's properties in the northeastern and southeastern parts of the country. In late 2005, the companies discovered kimberlites on Majescor's properties; further exploration was planned for 2006. Pan African also explored for diamond. Diamond Fields ceased its diamond exploration activities in Madagascar in 2005 (Majescor Resources Inc., 2005; Diamond Fields International Ltd., 2006, p. 11).

Gemstones.—Madagascar was one of the world's leading producers of sapphire; most domestically mined sapphire was produced by artisanal miners at Ilakaka, Manombe, and Sakara in the south-central part of the country. In July 2004, new mines were opened at Moramanga, which is located 46 km east of the Andilamena ruby deposits. Small amounts of sapphire were produced at Diego Suarez in northern Madagascar. Exports of sapphire decreased to an estimated 4,700 kilograms (kg) in 2005 compared with 5,890 kg in 2004 and 9,326 kg in 2002. The decline in production was attributable to the depletion of easily mined deposits near the surface at Ilakaka. Sapphire was discovered at depths of about 26 meters, but mining at that depth would require the use of machinery unavailable to artisanal miners (Henricus, 2005; Rampanjato, 2005b; Pardieu and Wise, 2006a, b).

Most sapphire and other gemstones were exported in rough form because of the lack of a significant domestic lapidary industry. The value of reported gemstone exports was also limited by high rates of smuggling. Illegal exports of sapphire to Thailand were estimated to be about 2,600 kilograms per year (kg/yr), and those to other countries, about 500 kg/yr. The value of undeclared gemstone exports was estimated to be $100 million. The World Bank Group planned to increase Madagascar's reported gemstone exports to between $40 million and $80 million per year mostly by expanding the domestic lapidary industry (Moscato, 2004; Gazette de la Grande Ile, 2005; Mercia, 2005).

Ruby was mined near Andilamena in north-central Madagascar and Vatomandry on the east coast. Exports of ruby were estimated to be 920 kg in 2005 compared with 741 kg in 2004 and 889 kg in 2002. The decline in production in 2004 was attributable to continued uncertainty about ownership of claims. Production increased in 2005 because of the discovery of a new deposit near the village of Tananarivekely, which is located near Andilamena. More than 15,000 miners and traders were working at Andilamena in mid-2005. Ruby mining reportedly led to environmental damage to the forest near Andilamena (Henricus, 2005; Rakotomalala, 2005b; Rampanjato, 2005b; Pardieu and Wise, 2006a).

Emerald was mined at Mananjary near the east coast. Exports of emerald rose to an estimated 60 kg in 2005 from 53 kg in 2004 and 31 kg in 2002. The increase in production may be attributable to a new find of high-quality emerald (Henricus, 2005; Rampanjato, 2005b).

Alexandrite, amethyst, aquamarine, garnet, and morganite were also produced at Ilakaka and Sakara. In recent years, almandine, grossularite, pyrope-spessartine, rhodolite, and spessartine garnet have been mined in Madagascar. A new mine in Vangainrano also produced aquamarine and green beryl. The supply of morganite, which is a type of beryl that obtains its pink color from inclusions of manganese, fell because of a cave-in at the most productive mine. Small amounts of pink tourmaline were produced from a new mine near Antsirabe (Henricus, 2005).

A wide variety of ornamental stones that included agate, labradorite, and rose quartz were also mined in Madagascar. In early 2004, cutting and polishing facilities employed about 1,000 workers, about 80% of whom were involved in cutting ornamental stones (Moscato, 2004).

Graphite.—The leading producer of graphite was Etablissements Gallois, which had mines at Ambalafotaka, Antsirakambo, and Marovintsy on the east coast. The company produced about 10,000 t/yr of graphite. Etablissement Izouard, Etablissement Rostaing, Société Louys, and Société Minière de la Grande Ile (a subsidiary of Société Participation Industrielle et Minières of France) also mined graphite. In 2005, exports of graphite were estimated to be 9,600 t at a value of $4.8 million, or nearly 1% of total exports (Ministère de l'Economie, des Finances et du Budget, 2005, p. 111).

Mineral Fuels and Related Materials

Petroleum.—Galana Petroleum Ltd. of Mauritius managed Madagascar's only petroleum products refinery at Toamasina. The company relied on imports to supply its refinery; Madagacar did not produce crude petroleum in 2005. National imports of petroleum and petroleum products amounted to $108 million in 2005, or 19% of total imports (Ministère de l'Economie, des Finances et du Budget, 2005, p. 112).

The Majunga Offshore concession was held by a joint venture of Exxon Mobil Corp. of the United States (40%), Norsk Hyrdo ASA of Norway (30%), and Vanco Energy Company of the United States (30%). ExxonMobil also held an exploration license that covered 36,500 km^2 off Cape St. Andre. Sterling Energy plc of the United Kingdom held the Ambilobe and the Ampasindva licenses, which were located to the north of the Majunga Offshore. In July 2005, Sterling signed a joint-venture agreement with ExxonMobil; the latter company agreed to pay for an exploration program in return for a 70% interest in Ambilobe and Ampasindva. Madagascar Oil (a subsidiary of Vuna Energy Ltd. of the United Kingdom) held production-sharing contracts for the exploration and development of natural gas and crude petroleum in six onshore blocks that included the bituminous sands at Tsimiroro and bituminous clay at Bemolanga (Sterling Energy plc, 2005).

Uranium.—In November 2005, Pan African entered into a joint-venture agreement with the Government agency L'Office des Mines Nationales et des Industries Strategiques (OMNIS) to explore, develop, and mine uranium at Faratsiho, Folakara, Makay, and Tranomaro. Pan African held an 80% interest in the joint venture and OMNIS, 20%. OMNIS approved the company's exploration program in July; an environmental protection agreement was signed with L'Institut des Sciences et Techniques Nucleaires in September. Pan African planned to spend as much $3.92 million on each of the properties, depending on the results of the initial four stages of exploration through preliminary feasibility study (Pan African Mining Corp., 2005a).

Infrastructure

Jiro Sy Rano Malagasy (JIRAMA) was the Government-owned utility that produced most of Madagascar's electricity. In April 2005, Lahmeyer International of Germany took over management of JIRAMA. The utility was experiencing severe financial difficulties; all its facilities were reported to be in disrepair (Africa Energy Intelligence, 2005).

In May 2005, domestic demand for electricity amounted to 155 megawatts (MW) of capacity; JIRAMA's effective capacity was 142 MW. The 58-MW Andekaleka hydroelectric power station supplied more than 50% of Madagascar's electricity. Heavy rainfall in the summer of 2004 washed substantial amounts of sand down the Andekaleka River into one of the plant's turbines; effective capacity was reduced to 29 MW. The European Investment Bank provided Alstom of France with funds to repair the Andekaleka plant starting in August 2005 (Africa Energy Intelligence, 2005).

Madagascar had a road network of more than 50,000 km, of which 11% was paved; the rehabilitation of 14,000 km of the road network was underway. The rail network amounted to 1,135 km, most of which was in the vicinity of Antananarivo.

Outlook

The International Monetary Fund (2006§) predicted that Madagascar's GDP would rise by 5.7% in 2006 and 6.3% in 2007. High rates of GDP growth may lead to increased domestic demand for such local construction materials as cement, gravel, limestone, and sand. Madagascar's beryl, chromite, gemstone, gold, graphite, and mica industries depended heavily upon world market conditions and domestic political stability; the same held true for such undeveloped mineral commodities as nickel, titanium, and zirconium. The depletion of placer sapphire deposits at Ilakaka and changes in the mining code designed to encourage large-scale capital investment could lead to an increase in mechanized sapphire mining operations (Pardieu and Wise, 2006b).

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TABLE 1
MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity[2]		2001	2002	2003[e]	2004[e]	2005[e]
METALS						
Beryllium, beryl in quartz concentrates, industrial and ornamental[e]		1,000	1,000	1,000	1,000	1,000
Chromium, marketable output:						
Chromite concentrate, gross weight	metric tons	6,599	2,700 [e]	12,000	21,000	35,000
Chromite ore, lumpy	do.	17,038	8,000 [e]	33,000	56,000	105,000
Total	do.	23,637	10,700	45,040 [3]	77,386 [3]	140,000 [3]
Gold, mine output, Au content[4]		(5)	-- [e]	10 [3]	5 [6]	5 [6]
INDUSTRIAL MINERALS						
Abrasives, natural (industrial only)[e]		1,300	1,300	1,300	1,300	1,300
Cement, hydraulic[e]	metric tons	51,882 [3]	30,000 [r]	80,000 [r]	130,000	180,000
Clay, kaolin[e]	do.	170	170	170	170	170
Feldspar[e]	do.	3	3	3	3	3
Gemstones:[6, 7]						
Amethyst[8]		383	617	620	620	620
Cordierite		4,241	158	160	160	160
Emerald		(5)	31	40	53 [6]	60
Garnet		2,092	599	600	600	600
Ruby		941	889	800	741 [6]	920
Sapphire		8,470	9,326	6,000	5,890 [6]	4,700
Tourmaline[8]		78,971	63,722	64,000	64,000	64,000
Graphite, all grades:	metric tons	2,013	2,000 [e]	15,000	15,000	15,000
Mica, phlogopite	do.	90	90 [e]	90	90	90
Ornamental stones:[7]						
Agate[e]		25,000	20,000	25,000	25,000	25,000
Labradorite	metric tons	797	4,183	6,600	8,000	8,000
Quartz[6]	do.	574	423	430	430	430
Salt, marine	do.	25,928	17,000	26,000	26,000	26,000
Stone:						
Dimension[e]	do.	200	200	200	200	200
Marble	do.	5,600	5,600 [e]	5,000	5,000	5,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	488	237	500	500	500
Kerosene and jet fuel	do.	332	163	350	350	350
Distillate fuel oil	do.	600	357	750	750	750
Residual fuel oil	do.	578	317	670	670	670
Liquefied petroleum gas	do.	41	14	30	30	30
Total	do.	2,039	1,088	2,300	2,300	2,300

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through September 13, 2006.

[2] In addition to the commodities listed, modest quantities of crude construction materials (other clays, sand and gravel, and stone) and industrial calcite presumably are produced, but output was not reported quantitatively, and available information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] Does not include smuggled artisanal production, which is estimated to be from 1,000 to 2,000 kilograms per year.

[5] Less than 1/2 unit.

[6] Reported exports.

[7] Does not include smuggled artisanal production.

[8] Includes both gem and ornamental quality.

TABLE 2
MADAGASCAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Holcim (Madagascar) S.A. (Holcim Group, 90%)	Plant at Ibity	150,000 cement; 120,000 clinker.
Do.		SA Nouvelle Cimenterie Amboanio (LaFarge Group, 66%, and Moustansir Ibaramdty Family, 34%)	Plant at Mahajanga	40,000 cement; 40,000 clinker.
Chromium		Kraomita Malagasy (Government, 100%)	Mine at Ankazotaolana	250,000 run of mine.
Do.		do.	Mine at Bemanekiva	40,000 run of mine.
Gemstones:				
Emerald	kilograms	Artisanal and small-scale miners	Mines at Mananjary	60.[e]
Labradorite		Marbres et Granits de Madagascar	Mines at Ambatofinandrahana and Bekily	4,200.[e]
Ruby	kilograms	do.	Mines at Andilamena and Vatomandry	1,000.[e]
Sapphire	do.	do.	Mines at Ilakaka and Sakara	5,000.[e]
Graphite		Etablissements Gallois	Artsirakambo Mine near Brickaville	4,800.
Do.		do.	Marovinsty Mine near Vatomandry	3,600.
Do.		do.	Ambalafotaka Mine	NA.
Do.		Société Minière de la Grande Ile (Société Participation Industrielle et Minières, 100%)	Ambatomitamba Mine near Tamatave	6,000.
Do.		Etablissements Izouard	Faliarno Mine near Moramanga	2,000.
Do.		Etablissements Rostaing and Société Louys	NA	NA.
Mica		Societe des Mines d'Ampandranhava	Tolagnaro	2,000 processed.
Petroleum, refined	thousand 42-gallon barrels	Galana International, Groupe Trimeta, Gulf Oil Corporation, and Petroleum India International	Refinery at Toamasina	5,475.

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

THE MINERAL INDUSTRY OF MALAWI

By Thomas R. Yager

Malawi, which is a small country in southern Africa, was a producer of cement, coal, crushed stone, dolomite, kaolin, lime, and limestone for domestic consumption (table 1). The country also produced and exported dimension stone and gemstones. Malawi had deposits of bauxite, columbium (niobium), granite, graphite, kyanite, monazite, phosphate rock, pyrite, silica sand, titanium, uranium, vermiculite, and zirconium (table 3).

Albidon Ltd. of Australia held exclusive prospecting licenses for the Bimbili River, the Bua River, the Chingale, the Katakwi and the Mpemba nickel and platinum-group metals (PGM) properties. The company completed a drilling program at Mpemba in 2005; further exploration was expected to start in the second quarter of 2006. Lisungwe plc of the United Kingdom explored for gold, nickel, and PGM in the Lisungwe-Kirk Range area in 2005 (Malawi Department of Mines, 2005; Albidon Ltd., 2006, p. 18, 63).

Millennium Mining Ltd. (a subsidiary of Malawi Minerals Ltd.) held exclusive prospecting licenses for the Lake Chilwa, the Makanjila, and the Salima mineral sands deposits. The company was engaged in feasibility studies of producing 500,000 metric tons per year (t/yr) of ilmenite from Makanjila and Salima. Depending on favorable results of these studies, Millennium planned to conduct a feasibility study of building a smelter at Chipoka to produce titanium slag (Malawi Department of Mines, 2005; Mining Review Africa, 2005).

Allied Procurement Agency and Mineral Sands Ltd. of South Africa obtained a mining license for mineral sands at Chipoka. In the first half of 2005, the companies were installing equipment for an 18-month pilot mining and processing program (Malawi Department of Mines, 2005).

Cement production increased to 119,500 metric tons (t) in 2004 from 23,900 t in 2003. Portland Cement Co. Ltd. (a subsidiary of LaFarge Group of France) produced about 85,000 t using clinker imported mainly from Zambia and Zimbabwe. Shayona Cement Corp. produced about 34,000 t using locally quarried limestone. In 2006, Shayona planned to increase its capacity to 110,000 t/yr from 37,000 t/yr. Zagaf Cement Sales of Malawi carried out an environmental impact assessment for a new cement plant at Cemkumbe with a capacity of 37,000 t/yr; the company planned to finish construction by the end of 2006 (Malunga, 2005).

In fiscal year 2004-05, the production of aggregate increased to 171,464 t from 153,537 t in fiscal year 2003-04 because of strong demand from the construction sector. Large-scale quarries accounted for 91% of domestic production, and artisanal miners, 9% (Malawi Department of Mines, 2005).

Gemstones produced in Malawi included amethyst, aquamarine, garnet, ruby, and sapphire. National gemstone production declined to 1,620 kilograms (kg) in fiscal year 2004-05 from 2,318 kg in fiscal year 2003-04. The Chimwadzulu Hill Mine produced ruby and sapphire; the capacity of the mine increased to 5 kilograms per month of gem-quality ruby and pinkish-orange sapphire with the installation of a new washing plant in late 2004. About 10% of the ruby mined was gem quality. Historically, ruby has accounted for 30% of the mine's production; pinkish-orange sapphire, 17%; and other sapphire, 53% (Boehm, 2004; Laurs, 2004; Malawi Department of Mines, 2005; Malunga, 2005).

Small-scale and artisanal miners produced such ornamental stones as blue agate and rose quartz. The production of ornamental stones declined to about 23 t in fiscal year 2004-05 from 417 t in fiscal year 2003-04 because of oversupply in world markets. Sunstone Ltd. and Robin Mines of Malawi explored for agate and sunstone (Malawi Department of Mines, 2005).

National lime production increased to 25,895 t in fiscal year 2004-05 from 22,340 t in fiscal year 2003-04. Production increased because of higher demand from the agricultural, construction, and paint manufacturing industries (Malawi Department of Mines, 2005).

In May 2005, Paladin Resources Ltd. of Australia announced plans to commence a bankable feasibility study of the Kayelekera uranium project; the company expected to complete the study by August 2006 at a cost of $2.3 million. Paladin planned to produce 1,000 t/yr of uranium oxide (U_3O_8) starting in April 2008 if the feasibility study yielded favorable results. The life of the mine was expected to be 10 years (Paladin Resources Ltd., 2005, p. 13, 17).

Outlook

Most of Malawi's cement, coal, crushed stone, and lime output was for local consumption in 2005. The short-term outlook for these commodities depends on the state of the domestic economy. The outlook for many undeveloped mineral deposits is tied to strong global demand because severe poverty limits domestic markets for columbium (niobium), rare-earth elements, titanium, and uranium. The Government plans to promote the development of local dimension stone, gemstone, graphite, and gypsum mining; pyrite deposits could also be mined for use in sulfuric acid if the Kayelekera uranium project moves forward.

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TABLE 1
MALAWI: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005[e]
Cement, hydraulic		180,761	174,283	23,900 [r]	119,500 [r]	120,000
Clay, kaolin		825	636	800 [e]	800 [e]	800
Coal, bituminous		34,410	43,372	47,037	40,891	49,000
Dolomite		49	4,394	5,400 [e]	5,400 [e]	5,400
Gemstones	kilograms	1,800 [e]	2,305	2,297	1,820	1,400
Lime		6,177	6,776	18,877	23,095	29,000
Stone:						
Crushed for aggregate		594,979	113,992	159,954	168,600	175,000
Dimension, crude and partly worked		483	130 [r]	100 [r, e]	-- [r]	--
Limestone, for cement		167,000 [e]	86,234	23,965	21,224	28,000
Ornamental		NA	120	450	320	20
Vermiculite		1	--	--	--	--

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through September 19, 2006.

[2] Data from 2005 are estimated based on reported data for fiscal year 2004-05.

[3] In addition to commodities listed, modest quantities of gypsum and salt and unlisted varieties of crude construction materials (clays, and gravel and other stone) may also be produced, but information is inadequate to make reliable estimates of output.

TABLE 2
MALAWI: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Portland Cement Co. Ltd.	Plant at Blantyre	288,000.
Do.		do.	Plant at Changalume	180,000.
Do.		Shayona Cement Corp.	Plant at Livwezi	37,000.
Coal, bituminous		Mchenga Coal Mines	Mine at Mchenga	60,000.
Dimension stone		Ilomba Granite of Blantyre	Mine at Ilomba Hill	NA.
Fertilizer		Optichem Ltd.	Plant at Blantyre	40,000.
Limestone		Shayona Cement Corp.	Mine in Kasungu Province	NA.
Ruby and sapphire	kilograms	Agricola Resources plc	Mine at Chimwadzulu Hill	180 ruby[e]; 420 sapphire.[e]

[e] Estimated. NA Not available.

TABLE 3
MALAWI: MINERAL RESOURCES IN 2005[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Bauxite	Mulanje Mountain	28.8 Mt	43.9% Al_2O_3	12.6 Mt Al_2O_3.
Clay, kaolin	Linthipe	14.1 Mt	33.8% Al_2O_3	NA.
Coal	Ngaga	15 Mt	NA	NA.
Do.	Mwabvi	4.7 Mt	NA	NA.
Do.	Livingstonia (Mchenga Mine)	2 Mt	NA	NA.
Columbium (niobium)	Tundulu	0.9 Mt	0.37% Nb_2O_5	3,300 t Nb_2O_5.
Do.	Chilwa Island	0.38 Mt	0.95% Nb_2O_5	3,600 t Nb_2O_5.
Do.	Ilomba Hill	0.1 Mt	3% Nb_2O_5	3,000 t Nb_2O_5.
Graphite	Katengeza	2.7 Mt	5.8% C	157,000 t graphite.
Limestone	Malowa Hill	15 Mt	48% CaO	NA.
Marble	do.	3.7 Mt	36.21% CaO	NA.
Phosphate rock	Tundulu	2 Mt	17% P_2O_5	340,000 t.
Pyrite	Chisepo	34 Mt	8% S	2.7 Mt.
Do.	Malingunde	10 Mt	12% S	1.2 Mt.
Silica sand	Mchinji	1.6 Mt	97% SiO_2	NA.
Strontium and rare earths	Kangankunde	11 Mt	8% Sr; 2% REE	880,000 t Sr; 220,000 t REE.
Titanium	Makaŋ'ila	1,000 Mt	5.2% ilmenite	52 Mt ilmenite
Do.	Lake Chilwa	1,000 Mt	7.05% ilmenite; 0.11% rutile; 1.16% zircon	71 Mt ilmenite; 1.1 Mt rutile; 12 Mt zircon.
Do.	Salima	500 Mt	8.4% ilmenite; 0.38% rutile; 0.28% zircon	42 Mt ilmenite; 1.9 Mt rutile; 1.4 Mt zircon.
Do.	Chipoka	210 Mt	NA	NA.
Do.	Tengani	108 Mt	11% ilmenite; 2% rutile; 1% zircon	12 Mt ilmenite; 2.2 Mt rutile; 1.1 Mt zircon.
Uranium	Kayelakera	9.4 Mt	0.12% U_3O_8	10,900 t U_3O_8.
Vermiculite	Mwanza District	2.5 Mt	4.9% vermiculite	120,000 t.

NA Not available.

[1] Abbreviations used in this table for commodities include the following: Al_2O_3--aluminum oxide; C--carbon; CaO--calcium oxide; Nb_2O_5--columbium (niobium) oxide; P_2O_5--phosphorous pentoxide; REE--rare-earth elements; S--sulfur; SiO_2--silicon dioxide; Sr--strontium; and U_3O_8--uranium oxide. Abbreviations used in this table for units of measurement include the following: Mt--million metric tons; and t--metric tons.

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THE MINERAL INDUSTRIES OF MALI, MAURITANIA, AND NIGER

By Omayra Bermúdez-Lugo

MALI

Mali's mineral sector was dominated by gold mining. Other mineral commodities produced were clay, gypsum, limestone, marble, salt, sand and gravel, and stone for domestic consumption. The Government agency responsible for the mining sector in Mali is the National Directorate for Geology and Mines, which is part of the Ministry of Mines, Energy, and Water Resources.

In 2005, at least 15 companies were engaged in gold exploration and/or production in Mali. These included Great West Gold Inc. (formerly Adven Inc.) of the United States; African Metals Corporation (AMC), Axmin Inc., Delta Exploration Inc., Etruscan Resources Inc., Glencar Mining plc, Great Quest Metals Ltd., IAMGOLD Corp., Nevsun Resources Ltd., North Atlantic Resources Ltd., and Robex Resources Inc. of Canada; AngloGold Ashanti Ltd., which was formed by the merger of AngloGold Limited of South Africa and Ashanti Goldfields Ltd. of Ghana in April 2004; Avnel Gold Mining Ltd. and Randgold Resources Ltd. of the United Kingdom; and Resolute Mining Limited of Australia.

Malian gold production was primarily from the Kalana, the Morila, the Sadiola Hill, and the Yatela Mines. According to Randgold Resources company reports, the Loulo Mine, which was under development in 2004, poured its first gold in September and shipped its first commercial consignment of bullion in November. During the year, about 1.2 million metric tons (Mt) of ore at a feed grade of 4.5 g/t gold were mined at the Loulo Mine and yielded more than 2,110 kilograms (kg) of gold (reported as 67,984 troy ounces). These five mines produced a total of 44,230 kg of gold in 2005 (table 1). Some gold (about 60 kilograms per year) was also produced by artisanal methods (AngloGold Ashanti Ltd., 2006, p. 69; Randgold Resources Ltd. 2006, p. 7, 14; Avnel Gold Mining Ltd., 2006§[1]).

More-extensive coverage of the mineral industry of Mali can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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MAURITANIA

Mauritania's mineral sector was dominated by iron ore mining and beneficiation. According to the Ministry of Mines and Industry (Ministère des Mines et de l'Industrie) (MMI), mining was one of the country's most important sectors to the national economy. It contributed about 12% to the gross domestic product and represented more than one-half of the country's export earnings (Ministère des Mines et de l'Industrie, 2005, p. 27). Other commodities produced in the country included cement, gypsum, and salt.

The MMI is the Government agency responsible for the mining industry. Société Nationale Industrielle et Minière (SNIM) was responsible for iron ore production and beneficiation. The company operated a mining center at the northern town of Zouerate, three open pit iron ore mines at Guelb El Rhein, Kedia d'Idjill, and M'Haoudat in northern Mauritania, port facilities at Nouadhi on the Atlantic coast, and a 700-kilometer-long railway that linked the mining center to the port facilities (Société Nationale Industrielle et Minière, 2005§). Iron ore that contained about 65% iron was mined from the Kedia d'Idjill Mine and the M'Haoudat Mine, and lower-grade ore that contained about 37% iron was mined from the Guelb El Rhein Mine (Société Nationale Industrielle et Minière, 2005§).

According to the Government, the number of foreign companies applying for prospecting licenses in the country was growing, and projects were at various development stages ranging from grassroots exploration to mine development. Large multinational companies that have explored or were exploring in the country included: Dia Met Minerals Ltd., Rex Diamond Mining Corporation, and Rio Narcea Gold Mines Ltd. of Canada; Ashton Mining Ltd., Sphere Investments Ltd., and Woodside Energy Ltd. of Australia; and the De Beers Group of South Africa. Diamond, gold, and petroleum were the main target products under exploration, although the Government reported that companies were also interested in copper, iron, lead, and zinc exploration. The country's reported identified mineral resources included about 160 Mt of phosphate rock, 120 Mt of salt, 22.6 Mt of copper, 9 Mt of gypsum, more than 1 Mt of sulfur, 400,000 metric tons (t) of peat, and 30 t of gold. Iron ore reserves were estimated to be 185 Mt of hematite ore that ranges from 60% to 68% iron and 660 Mt of lower quality magnetite ore that ranges from 36% to 40% iron (Ministère des Mines et de l'Industrie, 2005, p. 27).

In 2005, Rio Narcea Gold Mines Ltd. announced its decision to proceed with the development of the Tasiast gold project.

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[1] References that include a section mark (§) are found in the Internet Reference(s) Cited sections.

Capital costs for the project were estimated to be $63.5 million and production was expected to begin in mid-2007. The company reported total measured and indicated mineral resources to be about 12.1 Mt at a grade of 3.06 grams per metric ton (g/t) gold. Proven and probable ore reserves were reported to be about 8.9 Mt at a grade of 3.08 g/t gold, and inferred resources, about 12.4 Mt at a grade of 2.25 g/t gold (Rio Narcea Gold Mines Ltd., 2006, p. 10).

Sphere continued to develop the Guelb el Aouj iron ore project in joint venture with SNIM. Sphere was to earn a 50% stake in the project by investing $11 million towards a three-stage bankable feasibility study. The work program for stage 1 of the project, which included aerial survey and mapping, drilling, hydrogeology, marketing, metallurgical testwork, and relogging of existing drill cores, was completed in 2004 and that of stage 2A, which was focused on drilling the East deposit, began in March 2005. According to company reports, combined inferred resources at Guelb el Aouj's Centre and East deposits were estimated to be 675 Mt. Sphere estimated that high-grade magnetite concentrate at a grade of 70% iron could be recovered from both these deposits (Sphere Investments Ltd., 2006, p. 2-3).

In 2004, First Quantum Minerals Ltd. of Canada signed a letter of intent with the Government of Mauritania for the acquisition of an 80% interest in the Guelb Moghrein copper-gold deposit. Construction of mine facilities began in 2005. The company reported that logistics and difficulties in acquiring construction supplies had delayed the commissioning of the plant; the company expected to have the plant commissioned by the second quarter of 2006 and that production would begin in the third quarter of 2006. The envisioned operation is expected to produce about 30,000 metric tons per year (t/yr) of copper in concentrate and about 2,100 kg/yr (reported as 70,000 troy ounces per year; revised from 2004 Minerals Yearbook chapter) of gold in the form of copper-gold concentrates (First Quantum Minerals Ltd., 2006).

Several international oil companies, mainly Australian, were involved in offshore exploration in Mauritania in 2005. Previous exploration efforts had resulted in a series of discoveries, including the Chinguetti oilfield in 2001, the Banda oilfield in 2002, and the Tiof oilfield in 2003. As of November 18, 2005, Woodside Petroleum Ltd. of Australia held a 53.846% interest through production-sharing contracts (PSC) in the Banda and the Tiof oilfields and a 47.384% in the Chinguetti oilfield. The Chinguetti project was scheduled to be completed and to produce the first petroleum by 2006, with petroleum production averaging 75,000 barrels per day (bbl/d). Banda oilfield is located within the company's area A (PSC-A); Chinguetti and Tiof are located within the company's area B (PSC-B). The remaining partners in PSC-A were Hardman Resources Ltd. (24.3%), BG Group plc (13.084%), Fusion Oil and Gas Company (4.615%), and Roc Oil Ltd. (4.155%). The remaining partners in Tiof oilfield within PSC-B were Hardman Resources (21.6%), BG Group (11.63%), Premier Oil plc (9.231%), and Roc Oil (3.693%) and the remaining partners in the Chinguetti oilfield were Hardman Resources Ltd. (19.008%), Government-owned Groupe Project Chinguetti (12%), BG Group (10.234%), Fusion Oil and Gas (8.123%), and Roc Oil (3.250%) (Hardman Resources Ltd., 2005; Petroleum Economist, 2005).

More-extensive coverage of the mineral industry of Mauritania can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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NIGER

Mineral commodities produced in Niger were cement, coal, gold, gypsum, limestone, salt, tin, and uranium. In 2005, Niger was the world's sixth ranked producer of uranium (Uranium Information Centre Ltd., 2006§). Production of uranium decreased to 3,093 t in 2005 from 3,282 t in 2004 (table 1). Niger's main uranium resources are located within the sedimentary layers of the Iullemmeden Basin. Production of uranium came from the Akouta underground mine, which was operated by Compagnie Minière d'Akouta (COMINAK), and the Arlit open pit mine, which was operated by Société des Mines de l'Aïr (SOMAIR). COMINAK was owned by Areva NC [formerly known as Compagnie Générale des Matières Nucléaires (COGEMA)] (34%), the Government of Niger (31%), Overseas Uranium Resources Development Company of Japan (25%), and ENUSA Industrias Avanzadas, S.A. of Spain (10%). SOMAIR was owned by Areva NC (63.4%) and the Government of Niger (36.6%) (Areva NC, 2006§).

The Samira Hill gold mine, which was commissioned during the third quarter of 2004, produced a total of 3,005 kg (reported as 96,608 troy ounces) of gold in 2005 (Semafo Inc. 2006, p. 12). The company that operated the Samira Hill Mine was Société des Mines du Liptako S.A. (SML), which was a limited-liability company owned by African GeoMin Mining Development Corporation Ltd. (AGMDC) (80%) and the Government of Niger (20%). AGMDC was, in turn, owned by Etruscan Resources Inc. (50%) and Semafo Inc. (50%).

More-extensive coverage of the mineral industry of Niger can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web at URL http://minerals.usgs.gov/minerals/pubs/country.

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TABLE 1
MALI, MAURITANIA, AND NIGER: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2001	2002	2003[e]	2004[e]	2005[e]
MALI[2]						
Gold, mine output, gold content[3]	kilograms	42,288	56,043	45,535 [4]	37,911 [r, 4]	44,230 [4]
Gypsum[e]		500	500	500	300 [r]	300
Salt[e]		6,000	6,000	6,000	6,000	6,000
MAURITANIA[5]						
Cement		200,000	200,000 [e]	200,000	300,000 [r, 4]	300,000
Gypsum[e]		100,000	100,000	34,264 [4]	38,940 [4]	39,000
Iron ore:						
Gross weight	thousand metric tons	10,302 [6]	9,553 [6]	10,377 [7]	11,000 [7]	11,000
Iron content[e]	do.	6,700	6,200	6,890	7,200	7,200
Petroleum, refinery products:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	440	-- [4]	--	--	--
Gasoline	do.	1,900	-- [4]	--	--	--
Kerosene	do.	470	-- [4]	--	--	--
Distillate fuel oil	do.	1,100	-- [4]	--	--	--
Residual fuel oil	do.	2,450	-- [4]	--	--	--
Other	do.	700	-- [4]	--	--	--
Total	do.	7,060	-- [4]	--	--	--
Salt[e]		5,500	5,500	15 [4]	20 [4]	20
Steel, crude		5,000 [e]	5,000	5,000	5,000	5,000
NIGER[8]						
Cement, hydraulic[e]		47,000 [r, 4]	53,700 [r, 4]	53,700 [r]	53,700 [r]	53,700
Coal, bituminous		163,275	182,916	183,000	183,000	183,000
Gold[9]	kilograms	30	28	30	684 [4]	3,005 [4]
Gypsum		3,205	17,652	17,700	17,700	17,700
Limestone		103,726	146,399	146,000	146,000	146,000
Salt[e]		2,000	2,000	2,000	2,000	2,000
Sulfuric acid:						
Gross weight		55,000	62,000	67,000 [4]	70,000 [4]	70,000
Sulfur content		18,000	20,000	22,000	23,000	23,000
Tin, mine output, Sn content		9	11	11	3,100	3,100
Uranium, U content		2,920	3,076	3,143 [4]	3,282 [4]	3,093 [4]

[e] Estimated; estimated data are rounded to no more than three digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through August 23, 2006.

[2] In addition to the commodities listed, Mali produced clays, sand and gravel, and stone for local construction purposes in addition to diamond, marble, silver, and tin, but information is inadequate to make reliable estimates of output.

[3] Excludes artisanal production, which is estimated to be about 2,000 kilograms per year.

[4] Reported figure.

[5] In addition to the commodities listed, modest quantities of crude construction materials (clays, sand and gravel, and stone) presumably were produced, but output was not reported quantitatively. The minimill of Société Arabe de Fer et d'Acier en Mauritanie produced rebar and wire, but available information is inadequate to make reliable estimates of output.

[6] Reported by National Industrial and Mining Company.

[7] Reported by Ministère des Mines et de l'Industrie.

[8] In addition to the commodities listed, phosphate rock, tungsten ore, and a variety of construction materials (clays, sand and gravel, and stone) were produced but information is inadequate to make reliable estimates of output.

[9] Does not include unreported production.

TABLE 2
MALI, MAURITANIA, AND NIGER: STRUCTURE OF THE MINERAL INDUSTRIES IN 2005

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies	Location of main facilities	Annual capacity
MALI			
Gold	Société de la Mine d'or de Kalana (Avnel Gold Mining, 80%, and Government, 20%)	Kalana Mine, 300 kilometers south of Bamako	60,000 ore.
Do.	Société des Mines de Loulo (Randgold Resources Ltd., 80%, and Government, 20%)	Loulo Mine, 350 kilometers west of Bamako	2,400,000 ore.
Do.	Morila S.A. [a subsidiary of Morila Limited of Mali, 80% (AngloGold Ashanti Ltd., 40%; Randgold Resources Ltd., 40%; Government, 20%)]	Morila Mine, 180 kilometers southeast of Bamako	4,200,000 ore.
Do.	Société d'Éxploitation des Mines d'Or de Sadiola S.A. (AngloGold Ashanti Ltd., 38%; IAMGOLD Corp., 38%; Government, 18%; International Finance Corporation, 6%)	Sadiola Hill Mine, 77 kilometers south of Kayes	5,300,000 ore.
Do.	Société des Mines de Syama S.A. (Resolute Mining Limited, 80%, and Government, 20%)	Syama Mine, 300 kilometers southeast of Bamako	Undeveloped.[1]
Do.	Société d'Exploitation des Mines d'Or de Yatela (AngloGold Ashanti Ltd., 40%; IAMGOLD Corp., 40%; Government, 20%)	Yatela Mine, 50 kilometers south-southwest of Kayes	2,500,000 ore.
Do. kilograms	Artisanal miners	NA	60.
MAURITANIA			
Cement	Ciment de Mauritanie (Private Mauritanian investors, 90%, and Compañía Valenciana de Cementos Portland, 10%)	Nouakchott	545,000 cement and clinker.
Do.	Mauritano-Francaise des Ciments S.A.	do.	NA.
Iron ore	Société Nationale Industrielle et Minière (SNIM) (Government, 78%, and Arab financial and mining investors, 22%)	Guelb El Rhein, Kedia d'Idjill, and M'Haoudat Mines	12,000,000 ore.
Gypsum	Société Arabe des Industries Metallurgiques Mauritano-Koweitiennes (SAMIA)	Sebkha N'dramcha between Nouakchott and Akjoujt	NA.
Salt	Société Mauritanienne des Industries du Sel (SOMISEL)	N'terert and d'Idjill brine pits	NA.
NIGER			
Coal	Société Nigérienne de Charbon (SONICHAR)	Anou Araren, central Agadez region	300,000.
Gold	Société des Mines du Liptako S.A. (SML) [African GeoMin Mining Development Corporation Limited (which is owned by Etruscan Resources Inc., 50%, and Semafo Inc., 50%), 80%; Government, 20%]	Samira Hill Mine, 90 kilometers west of Niamey	NA.
Uranium	Compagnie Minière d'Akouta (COMINAK) (Areva NC, 34%; Government, 31%; Overseas Uranium Resources Development Co., 25%; ENUSA Industrias Avanzadas S.A., 10%)	Akouta underground mine, northern Niger	2,500.
Do.	Société des Mines de l'Aïr (SOMAIR) (Areva NC, 63.4%, and Government, 36.6%)	Arlit open pit mine, northern Niger	2,300.

NA Not available.

[1] According to Resolute Mining Ltd. company reports, the feasibility study on the redevelopment of the Syama Mine was completed in 2005. The company company announced a total resource of about 200,000 kilograms (reported as 6.4 million troy ounces of gold). A decision to proceed with the full development of the mine had not been reached as of yearend 2005.

THE MINERAL INDUSTRIES OF MOROCCO AND WESTERN SAHARA

By Omayra Bermúdez-Lugo

MOROCCO

Morocco is located in northern Africa and is bordered by Algeria to the east, the Atlantic Ocean to the west, the Mediterranean Sea to the north, and Western Sahara to the south. Morocco is one of the world's leading producers of phosphate rock. In addition to phosphate rock, the country produced a wide variety of such minerals as coal, cobalt, copper, gold, iron ore, lead, manganese ore, mercury, natural gas, nickel, petroleum, silver, steel, and zinc. Industrial minerals produced included arsenic, barite, cement, clay, feldspar, fertilizers, fluorspar, gypsum, phosphoric acid, salt, strontium, sulfuric acid, and talc.

Production and Trade

In 2005, Morocco's metals output registered mixed results, which included declines in the production of ores and concentrates of cobalt, copper, and iron and increases in the production of ores and concentrates of lead, manganese, and zinc. Among industrial minerals, phosphate rock (P_2O_3 content) production rose by 8% compared with that of 2004 (table 1). The latest available official Moroccan trade statistics (2004) show exports of phosphate rock and phosphoric acid to have amounted to 11.7 million metric tons (Mt) and about 2.1 Mt respectively, which were increases of 6.4% and 16.2%, respectively, compared with exports in 2003. Among exports of metals, silver exports (in terms of value) increased by 11% compared with those of 2003; exports of copper and zinc ores and concentrates amounted to 12,000 metric tons (t) and 180,000 t, respectively, which, when compared with exports in 2003, decreased by about 40% and 14%, respectively. Exports of petroleum refinery products amounted to 158,000 t, which was an increase of about 35% compared with that of 2003 (Statistical Directorate of the Kingdom of Morocco, 2005, p. 118-125). Selected mineral imports included coal (5.5 Mt of crude and agglomerate), crude petroleum (6.1 Mt), petroleum refinery products (2.1 Mt), and iron and steel (1.3 Mt). Petroleum, iron and steel, and coal imports registered increases of about 32%, 17%, and 12%, respectively, compared with those of 2003; refined petroleum imports declined by about 26% (Statistical Directorate of the Kingdom of Morocco, 2005, p. 118-125).

Of the countries that exported goods to Morocco in 2004, the United States ranked eighth (in terms of value); of the countries that imported goods from Morocco, the United States ranked fifth (Statistical Directorate of the Kingdom of Morocco, 2005, p. 118-125). According to the U.S. Census Bureau, Moroccan exports to the United States were valued at about $442.5 million in 2005 compared with $515 million in 2004. These included more than $15.5 million of petroleum products and $93 million of nonmetallic minerals (U.S. Census Bureau, 2005b§[1]). Imports from the United States were valued at about $527.5 million in 2005 compared with more than $525.7 million in 2004. These included about $7.4 million of excavating machinery, more than $10.5 million of petroleum products, $3.8 million of coal, and $880,000 of drilling and oilfield equipment (U.S. Census Bureau, 2005a§).

Structure of the Mineral Industry

The Office National des Hydrocarbures et des Mines (ONHYM) was the Government entity responsible for exploring for and promoting of national mineral resources. The state-owned Office Chérifien des Phosphates (OCP) managed phosphate mining and beneficiation and owned most of the phosphoric acid and phosphate fertilizer production facilities. The leading private mining company in the country was Groupe Omnium Nord Africain (Groupe ONA) of Morocco through its equity interests in Managem S.A. and Société Nationale d'Ivestissement S.A. (SNI). Managem operated six mines in Morocco: the Akka gold mine, the Bou-Azzer cobalt mine, the Draa Sfar and the Guemassa copper-lead-zinc mines, El Hammam fluorspar mine, and the Imiter silver mine (Mining Review Africa, 2005).

Commodity Review

Metals

Compagnie de Tifnout Tiranimine (CTT), which was a subsidiary of Managem, mined cobalt ore at Bou-Azzer. Cobalt concentrates and tailings from Bou-Azzer were refined at the Guemassa plant. The Guemassa plant also produced about 6,000 metric tons per year (t/yr) of arsenic trioxide (Mining Review Africa, 2005).

On November 21, 2005, Odyssey Resources Ltd. of Canada announced that it had completed a preliminary sampling program of tailings at two past-productive copper-silver deposits near the company's Anti Atlas copper-silver property. Samples were shipped to Florin Analytical Services in Reno, Nevada, for copper and silver analysis to determine the possible economic value of the tailings (Odyssey Resources Ltd., 2005).

Compagnie Minière de Guemassa (CMG), which was a subsidiary of Managem, operated the underground polymetallic Hajar Mine at Guemassa. Managem's industrial processing complex at Guemassa produced about 160,000 t of zinc concentrates, 30,000 t of lead, and 10,000 t of copper concentrates annually (Mining Review Africa, 2005).

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[1] References that include a section mark (§) are found in the Internet Reference(s) Cited sections.

Silver in Morocco occurs both as the primary mineral in ore deposits at Igoudrane and Imiter and as a byproduct of cobalt, copper, lead, and zinc mining operations. Most of the country's silver production came from the Imiter Mine, which was owned and operated by Société Metallurgique d'Imiter (SMI) (a subsidiary of Managem).

Industrial Minerals

The Moroccan cement industry comprised four companies: Asment de Temara; Holcim (Maroc) S.A.; Lafarge S.A. (Lafarge) through Lafarge Ciments (Maroc), which was a 50% owned subsidiary of the Lafarge Group of France; and Société des Ciments du Maroc S.A. According to International Energy Agency (2005) statistics, in 2004, the combined cement and clinker production capacity of these companies was 11.1 million metric tons per year (Mt/yr) and about 9.8 Mt/yr, respectively.

Metalex Ventures Ltd. of Canada continued to explore for diamond in southern Morocco during the year. The company's concession covered an area of 24,800 square kilometers (km^2) of Archean cratonic and Proterozoic rocks, which the company considered to be highly prospective for diamond-bearing kimberlite and for base and precious metals, including platinum-group metals and iron ore.

OCP mined phosphate ore from the Ben Guerir, the Khouribga, and the Youssoufia mines. The company's Khouribga operations were spread out over a radius of 30 kilometers (km) and included three mines: the Sidi Chennane Mine, the Mera El Arech Mine, and the Sidi Daoui Mine, which had production capacities of 8 Mt/yr, 6 Mt/yr, and 4 Mt/yr, respectively. Sidi Daoui Mine was being gradually depleted of ore. Operations at Khouribga switched from underground methods to open pit methods in 1993.

The Government was considering cooperative ventures with foreign companies to further develop the phosphates industry. Construction work was scheduled to begin in December at the Jorf Lasfar 375,000-t/yr phosphoric acid plant and at a 1.5-Mt/yr sulfuric acid plant. The Government had signed a 50-50 joint-venture agreement in 2004 with Fauji Fertiliser Bin Qasim Ltd. of Pakistan to develop the integrated plant at Jorf Lasfar at a cost of about $200 million. The plant, which will use about 1.3 Mt/yr of phosphate rock from OCP's Khouribga Mine, was scheduled to be completed by 2007 and would feed Fauji's 450,000 t/yr diammonium phosphate plant in Pakistan (Middle East Economic Digest, 2005b).

OCP continued with its plans to establish a 50-50 joint-venture with Bunge Fertilizantes S.A. of Brazil for the development of a 365,000-t/yr integrated phosphates fertilizer and phosphoric acid plant at Jorf Lasfar at a cost of $265 million. Construction was expected to take 30 months, and commissioning was scheduled for 2008. Bunge and OCP had agreed in May on a long-term strategic alliance under which OCP would supply about 70% of Bunge's phosphate import requirements for the Latin America market (Middle East Economic Digest, 2005c).

In September, OCP signed a memorandum of understanding (MOU) with Sinochem Corporation of China to conduct a feasibility study for a new phosphoric acid plant at Jorf Lasfar and for the supply of 750,000 t/yr of diammonium phosphate to Sinochem from 2007 to 2011. The phosphate will come from a new 850,000-t/yr plant that was to be commissioned at Jorf Safar in December (Middle East Economic Digest, 2005c).

Mineral Fuels

According to the U.S. Energy Information Administration (2006§), as of January 2006, Morocco had proven oil reserves of about 1 million barrels and natural gas reserves of about 60 billion cubic feet. The country produced small volumes of natural gas and petroleum from the Essaouira Basin and small amounts of gas from the Gharb Basin and was North Africa's leading importer of petroleum and natural gas. Morocco was a transit center for Algerian gas exports to Portugal and Spain; exports were transported across the Strait of Gibraltar via the Maghreb-Europe Gas (MEG) pipeline.

Morocco's two petroleum refineries, which were located at Mohammedia and Sidi Kacem, had a combined capacity of about 155,000 barrels per day (bbl/d). In 2005, a $614 million engineering, procurement, and construction contract was awarded to Samprogetti SPA of Italy and Tekfen Company of Turkey for the first phase of a refurbishing project at the 126,000-bbl/d Mohammedia refinery. The supervision contract for the project was awarded to Foster Wheeler of the United States. Engineering and procurement work was expected to begin in July and to last between 18 and 24 months; construction work was set to begin in mid-2006 and commissioning was scheduled for mid-2008. Société Anonyme Marocaine de l'Industrie du Raffinage (Samir) was to finance $306 million of the estimated $760 million project. Moroccan banks would finance $227 million; the African Development Bank, $81.4 million; international banks, $261 million; and the remainder would be financed by Attijari Wafabank, Banque Marrocaine du Commerce Exterieur, Barclays Capital, and BNP Paribas (Middle East Economic Digest, 2005a). A tender was to be released in September for the construction of a 25-megawatt (MW) powerplant at the refinery and, later in the year, for a 250-km pipeline that would link the refinery to the Gazoduc Maghreb Europe pipeline (Middle East Economic Digest, 2005c).

Outlook

According to the Organisation for Economic Co-operation and Development (2006, p. 371) Morocco's real gross domestic product (GDP) was expected to grow by 5.3% in 2006 compared with a growth of 2.1% in 2005; growth in the energy and mining sectors was expected to be 4.5% in 2006. The Government's plans to establish joint ventures with foreign companies to further develop the phosphates industry, plans to bring the Jorf Lasfar phosphoric acid and sulfuric acid plants online by 2007 and 2008, and signing of an MOU with Sinochem of China for the development of yet another phosphoric acid plant at Jorf Lasfar by 2011 suggest that the phosphates industry is likely to continue to dominate Morocco's minerals sector for the next 5 to 6 years.

More-extensive coverage of the mineral industry of Morocco can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the World Wide Web via URL http://minerals.usgs.gov/minerals/pubs/country.

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WESTERN SAHARA

According to the U.S. Department of State (2005§), the issue of sovereignty over Western Sahara remained unresolved in 2005. The territory, a desert area that borders the Atlantic Ocean between Mauritania and Morocco, is contested by Morocco and the Popular Front for the Liberation of the Saguia el Hamra and Rio de Oro (Polisario), which is an independence movement based in Tindouf, Algeria. Western Sahara's economy was dependent on pastoral nomadism, fishing, and phosphate mining.

More-extensive coverage of the mineral industry of Western Sahara can be found in the 2003 and 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and The Middle East, which are available on the Internet at URL http://minerals.usgs.gov/minerals/pubs/country.

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TABLE 1
MOROCCO AND WESTERN SAHARA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
METALS						
Antimony, sodium antimonate		436	532	500	500	500
Cobalt:						
Concentrates, gross weight		15,725	16,896	16,178	18,410 [r]	13,030 [3]
Co content		1,242	1,453	1,391	1,600	1,100
Metal[4]		1,341	1,354	1,431	1,594 [r]	1,613 [3]
Copper:						
Concentrates, gross weight		19,120	17,799	17,539	14,200 [3]	12,650 [3]
Matte, gross weight		1,580	2,016	2,505	1,600	714 [e]
Cu content, concentrates and matte		5,400	5,000	4,900	4,400	2,800
Gold	kilograms	1,191	2,747	1,863	1,493 [r]	1,786 [3]
Iron and steel:						
Iron ore:						
Gross weight		7,976	8,736	6,300	9,900 [3]	8,130 [3]
Fe content[e]		4,300	4,700	3,400	5,300	4,400
Metal:[e]						
Pig iron		15,000	15,000	15,000	15,000	15,000
Steel, crude		5,000	5,000	5,000	5,000	5,000
Lead:						
Concentrate:						
Gross weight		110,906	88,582	54,779	58,810 [r]	59,920 [3]
Pb content		76,747	62,400	38,600	41,400 [r]	42,200
Cupreous matte, Pb content[e]		500	600	600	600	600
Metal:						
Smelter, primary only		58,178	71,840	62,000	40,712 [r]	54,460 [3]
Refined:						
Primary		58,178	71,840	61,473	35,000 [3]	35,000
Secondary[e]		3,000	3,000	3,000	4,000 [3]	4,000
Total[e]		61,000	75,000	64,000	39,000	39,000
Manganese ore, largely chemical-grade		13,757	18,064	--	9,050 [r]	11,270 [3]
Mercury[e]		10	10	10	10	10
Nickel content of nickel sulfate		151	109	126	348 [r]	499 [3]
Silver:						
Ag content of concentrates and matte	kilograms	42,400 [e]	57,000 [e]	25,400 [e]	26,000	26,000
Ag content of mine and smelter bullion	do.	238,043	220,000 [e]	175,155	170,000 [e]	170,000
Total	do.	280,000 [e]	277,000	201,000	196,000 [3]	196,000
Zinc concentrate:						
Gross weight		174,831	178,476	136,433	146,200 [3]	151,270 [3]
Zn content		89,339	90,487	69,200	74,600 [3]	77,100
INDUSTRIAL MINERALS						
Arsenic trioxide		6,026	5,469	6,872	6,866 [r]	8,939 [3]
Barite		471,102	469,934	358,500	415,200 [r]	475,575 [3]
Cement, hydraulic	thousand metric tons	10,000 [e]	10,200 [e]	10,400	11,000	11,000
Clays, crude:						
Bentonite		71,741	58,754	67,700	85,400 [3]	64,350 [3]
Fuller's earth (smectite)		40,664	43,243	14,944	28,700 [r]	29,060 [3]
Montmorillonite (ghassoul)		2,270	2,329	927	1,240 [r]	1,010 [3]
Feldspar		8,979	19,401	20,000	30,270 [r]	27,795 [3]
Fertilizers	thousand metric tons	2,719	2,602	2,542	2,405 [3]	2,400
Fluorspar, acid-grade		96,500	94,911	81,255	112,100 [3]	114,740 [3]
Gypsum[e]		550,000	600,000	600,000	600,000	600,000
Phosphate rock:						
Gross weight[5]	thousand metric tons	21,983	23,038	22,877	26,675 [r]	28,788 [3]
P_2O_5 content	do.	7,400	7,700	7,400	8,507 [r]	9,195 [3]
Phosphoric acid	do.	2,819	2,921	2,930	3,254 [3]	3,392 [3]

See footnotes at end of table.

TABLE 1--Continued

MOROCCO AND WESTERN SAHARA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
INDUSTRIAL MINERALS--Continued						
Salt:[6]						
Rock		233,816	266,903	236,700	278,880 [r]	319,900 [3]
Marine[e]		40,000	27,622 [3]	36,000	36,000	36,000
Total		273,816	294,525	272,700	314,880 [r]	356,000
Strontium minerals, celestite		1,879	3,780	2,700	2,700	2,700
Sulfuric acid		NA	8,600	8,900	9,500	9,500
Talc and pyrophyllite		27,246	39,612	1,959	255 [r]	-- [3]
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite		1,908	322	214	200	200
Gas, natural:						
Gross	million cubic meters	49 [e]	63	61	40 [3]	40 [3]
Dry[e]	do.	43	55	54	35	35
Petroleum:						
Crude[7]	thousand 42-gallon barrels	95 [e]	49	90	246 [3]	245 [3]
Refinery products:						
Liquefied petroleum gas	do.	2,710	2,690	1,000	3,000	3,000
Gasoline	do.	2,960	3,210	1,500	3,200	3,300
Jet fuel	do.	900	1,090	500	1,000	1,000
Kerosene	do.	880	620	300	900	900
Distillate fuel oil	do.	21,970	17,330	9,000	24,000	24,000
Residual fuel oil	do.	16,000	14,000	7,000	17,000	18,000
Other	do.	1,500	1,450	700	2,000	2,000
Total	do.	46,920	40,390	20,000	51,000	52,000 [3]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through November 28, 2006.

[2] In addition to the commodities listed, perlite and a variety of crude construction materials are produced, but information is inadequate to make estimates of output.

[3] Reported figure.

[4] Cobalt electrowon from cobalt concentrates and tailings from the Bou-Azzer Mine.

[5] Reported production from Morocco and Western Sahara.

[6] May include production from Western Sahara.

[7] Data for 2000 are based on crude oil and condensate production, which was reported as 13,106 metric tons.

Source: Fédération de l'Industrie Minérale.

THE MINERAL INDUSTRY OF MOZAMBIQUE

By Thomas R. Yager

In 2005, the mineral industry of Mozambique produced aluminum, gold, tantalum, and such industrial minerals as bauxite, beryl, brick clay, diatomite, gemstones, graphite, and salt and building materials that included cement, granite, gravel, limestone, marble, and sand. The country also produced coal and natural gas. Deposits of asbestos, bentonite, copper, feldspar, fluorspar, gypsum, iron ore, manganese, mica, nepheline syenite, perlite, phosphate rock, rare earths, silica sand, titanium, and zirconium have also been identified.

The International Monetary Fund (2006, p. 184) estimated that Mozambique's real gross domestic product (GDP) grew by 7.7% in 2005 compared with a revised 7.5% in 2004. In 2004, manufacturing accounted for 14% of the GDP; construction 9.6%; electricity and water, 1.9%; and mining, 1.8%. The nominal GDP based on purchasing power parity amounted to $27 billion in 2005 (International Monetary Fund, 2005, p. 41; 2006§[1]).

The value of output in the mining sector increased by 216% in 2004 and 40% in 2005; most of the increase in 2004 was attributable to the commencement of the Temane natural gas project and increased tantalite production. In 2005, natural gas production continued to rise; bauxite, beryl, gold, and granite production also increased. These increases were partially offset by decreases in the output of coal, gemstones, tantalite, and such construction materials as brick clay, limestone, marble, and sand; bentonite and quartz mining was shut down (Government of Mozambique, 2005, p. 28; Organisation for Economic Cooperation and Development, 2006, p. 389).

Commodity Review

Metals

Aluminum.—Mozambique was Africa's second ranked producer of aluminum behind South Africa. The Mozal aluminum smelter, which used alumina imported from western Australia as raw material, increased output to 555,000 metric tons (t) in 2005 compared with 549,000 t in 2004 and 407,000 t in 2003 (table 1). Production increased in 2003 and 2004 because of the completion of the Mozal 2 project, which doubled Mozal's rated capacity to 506,000 metric tons per year (t/yr) (table 2; BHP Billiton Ltd., 2005a, p. 2; 2006, p. 2).

BHP Billiton Ltd. completed feasibility studies for the expansion of the Mozal smelter. The Mozal 3 project would increase the rated capacity of the smelter by an additional 250,000 t/yr by 2009. Final approval of the project was pending the outcome of negotiations on long-term power supply contracts (Hill, 2006).

Exports of aluminum rose to $915 million in 2004 (the latest year for which data were available) compared with nearly $568 million in 2003. In 2004, aluminum accounted for 61% of Mozambique's total exports. From 2000 to 2004, aluminum accounted for 75% of the total growth in the country's exports (International Monetary Fund, 2005, p. 69).

E.C. Meikles (Pty.) Ltd. of Zimbabwe operated a small bauxite mine in Manica Province. In 2005, output was 9,518 t compared with 6,723 t in 2004 and 11,793 t in 2003. Exports amounted to 6,610 t in 2005 (Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

Gold.—Mozambique's gold resources were located in lode and placer deposits throughout the country; gold was produced by artisanal miners. Officially reported production of gold was 63 kilograms (kg) in 2005 compared with 56 kg in 2004. Reported gold output was expected to rise in 2006 because of increased efforts by the Government to support the marketing of artisanal gold production (Government of Mozambique, 2005, p. 28-29; Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

Artisanal gold miners in the Manica District produced gold at an estimated rate of 40 kilograms per month (kg/mo) to 50 kg/mo; mercury used during the production process was consumed at a similar rate. Most of this production was not sold to the Government because private buyers were more likely to be present at mine sites and were willing to provide free mercury in return for guaranteed gold sales. The Global Environment Facility, the United Nations Industrial Development Organization, and the United Nations Development Programme instituted a pilot project to assist miners in reducing mercury pollution problems (United Nations Industrial Development Organization, 2005, p. 15, 26).

Central African Mining and Exploration Company plc (CAMEC) explored for gold at its Muda River project in the Nhamatando District in Sofala Province. The company also held a license to purchase and export gold and silver, which it was using to encourage local artisanal production and to raise cash to finance its operations (Central African Mining and Exploration Company plc, 2005b).

Pan African Resources plc of the United Kingdom held a license for the Manica project. In October 2005, the company estimated that resources at Manica were 5.3 million metric tons (Mt) at a grade of 4.8 grams per metric ton gold (Pan African Resources plc, 2005).

Nickel.—African Eagle Resources plc held a prospecting license for the Muazua nickel project in northern Mozambique. The company carried out exploration at Muazua during the first half of 2005.

Tantalum.—National production of tantalite was 281,212 kg in 2005 compared with 712,095 kg in 2004 and 188,695 kg in 2003. Fleming Family & Partners owned a majority stake in the Marropino Mine through Highland African Mining Company (HAMC). In July 2004, HAMC was awarded a license to produce tantalite from the Morrua Mine, which had been shut down since the 1980s. Until August 2005, development of the mine was on hold because of legal concerns; Companhia Mineira de Morrua, which was the previous owner of the mining rights for Morrua, was unsuccessful in its lawsuit against the Government. If the Morrua Mine were to be reopened, it could produce as much as 230,000 kilograms per year (kg/yr) of tantalum oxide (Ta_2O_5) (Richardson, 2005; Sunday Times, 2005; Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

CAMEC was producing at a rate of about 17,000 kg/yr of Ta_2O_5 in September 2004. The company engaged in an upgrade of its production facilities to raise production to 27,000 kg/yr of Ta_2O_5 by May 2005 and 54,000 kg/yr of Ta_2O_5 by December 2005. CAMEC held prospecting and exploration licenses for tantalum and associated minerals in the Alto Molocue, the Lugela, and the Mocuba Districts in Zambezia Province, and for tantalum and tin in the Nhamatando District in Sofala Province (Central African Mining and Exploration Company plc, 2004).

In September 2004, TAN Mining and Exploration of South Africa decided to proceed with the reopening of the Muiane Mine. The company planned to restart mining in mid-2005 at a cost of $5 million. TAN planned to produce 82,000 kg/yr of Ta_2O_5 in concentrate from 420,000 t/yr of ore; the tantalite recovery rate would be about 60%. The expected life of the mine was 5 years (Mining Review Africa, 2005). Given the sharp decline in domestic tantalite production in 2005, it is unclear whether the Muiane Mine actually reopened.

Titanium and Zirconium.—The Corridor Sands Project was based upon 10 deposits of heavy-mineral sands near Chibuto in southern Mozambique. Starting in the third year of the project, WMC Resources Ltd. of Australia planned to produce 375,000 t/yr of titanium slag, 184,300 t/yr of high-purity pig iron, 21,500 t/yr of zircon, 5,100 t/yr of rutile, and 2,700 t/yr of leucoxene in the initial phase of the project. Production could eventually rise to 1 million metric tons per year (Mt/yr) of titanium slag, 491,100 t/yr of high-purity pig iron, 62,500 t/yr of zircon, 12,200 t/yr of rutile, and 6,400 t/yr of leucoxene. The initial phase of the project was expected to cost $500 million. In 2005, WMC was purchased by BHP Billiton, which proceeded to conduct a review and updates of previous feasibility studies. BHP Billiton was also considering the development of the TiGen mineral sands project at Moebase (WMC Resources Ltd., 2003; BHP Billiton Ltd., 2005b, p. 76).

Kenmare Resources plc of Ireland continued construction of the Moma mineral sands mine in 2005. The company planned to start production during the second half of 2006 and to produce 701,000 t/yr of ilmenite, 60,000 t/yr of zircon, and 17,000 t/yr of rutile. Moma's projected lifetime was 20 years. Capital costs were expected to be $348 million; annual revenues, $85 million; and annual operating costs, $23 million. Kenmare signed contracts for the purchase of 50% of the ilmenite production for the first 5 years of operation (Mining Journal, 2004; Kenmare Resources plc, 2005a, p. 4; b).

Industrial Minerals

Cement.—National cement consumption increased by about 6% to more than 700,000 t in 2005. Cimentos de Mocambique SARL [Cimentos de Portugal, SGPS, SA (Cimpor), 65.4%] was the country's only cement producer prior to 2005. Cimpor operated plants at Dondo, Matola, and Nacala. The company was forced to import about 100,000 t of clinker in 2005 because of operational problems at the Matola plant. Cimpor started upgrades to the Nacala grinding plant and a feasibility study on restarting the clinker production line at Dondo (Cimentos de Portugal, SGPS, SA, 2006, p. 71-72).

In mid-2005, a new cement plant with a capacity of about 250,000 t/yr was completed in Nacala by ARJ Group at a cost of $18 million. The new plant was expected to alleviate the shortage of cement in northern Mozambique. ARJ Group exported some of its output to Madagascar and Malawi and planned to sell to other countries in the region (Mozambique News Agency, 2005c).

Clay and Shale.—Mozambique had deposits of bentonite, brick clay, and kaolin. Brick clay production fell to 32,031 t in 2005 from 108,231 t in 2004 and 100,176 t in 2003. Cia Desenvolvimento Mineira ceased mining bentonite at Boane in southern Mozambique after resuming operations in 2004; production previously had been shut down by flooding. The company continued to produce small amounts of processed bentonite (Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

Gemstones.—The mine output of garnet was 2,172 kg in 2005 compared with 2,686 kg in 2004 and 440 kg in 2003; the production of aquamarine, dumortierite, and tourmaline also fell sharply. Sociedade Mineira de Cuamba E.E., which held the rights to the Cuamba garnet mine, was privatized in 2005; investments by the new owner were expected to result in higher garnet production in 2006. The production of dumortierite was likely to increase with the completion of access roads near the mines. The Government planned to increase monitoring of and technical assistance to small-scale producers of tourmaline in 2006 (Government of Mozambique, 2005, p. 28; Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

Stone, Dimension.—One of Mozambique's few large-scale marble quarries was located at Montepuez in Cabo Delgado Province. Marble from Montepuez was processed into finished products at a plant in Pemba, some of which were exported to Portugal. In 2005, the production of marble blocks fell by nearly 18%, and marble slabs, by 10%. Granite production, however, increased sharply in 2005 (Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

Mineral Fuels

Coal.—The production of coal has been limited in recent years because damage to the Sena rail line during the civil war in the 1980s cut off access from the Moatize coalfield to overseas markets. More recent declines in production may have been attributable to downtime caused by the rehabilitation and installation of new equipment at the Chipanga XI Mine. Output fell to 3,417 t in 2005 from 16,525 t in 2004 and 36,742 t in 2003. Exports of coal fell to 10,032 t in 2005 compared with 30,288 t in 2004; coal was exported to Malawi. In 2006, coal production was expected to increase because of the completion of repairs at the Chipanga XI Mine and rising regional demand for coal (Government of Mozambique, 2005, p. 27; Fatima Momade, National Director, National Directorate of Mines, written commun., April 17, 2006).

Companhia Vale do Rio Doce (CVRD) of Brazil planned to complete a feasibility study on the development of the Moatize coalfield in June 2006. If the feasibility study yielded favorable results, CVRD planned to build a mine that would produce 14 Mt/yr of coal. Production was expected to start in 2009. The company also planned to build a coal-fired power station with a capacity of 1,500 megawatts (MW). Most of the production from the new mine would be coking coal for consumption by steel plants in Brazil; the remainder was expected to be thermal coal for domestic consumption and export to African markets. Development of the Moatize Mine would also require rehabilitation of the railway from Beira to Tete, and the construction of a maritime export terminal at Beira. Total costs of the project were expected to be $1 billion (Mozambique News Agency, 2004; Metal Bulletin, 2005).

In August 2005, the Government awarded 10 coal exploration licenses to CAMEC. The company planned to focus initially upon its licenses in the Moatize coalfield, which had estimated resources of 2.4 billion metric tons (Gt) of coal. CAMEC also planned to explore at its licenses in the Mucanha coalfield, which had estimated resources of 3.6 Gt (Central African Mining and Exploration Company plc, 2005a).

Natural Gas.—Mozambique's production of natural gas rose to 2.31 billion cubic meters in 2005 from nearly 1.3 billion cubic meters in 2004 and 1 million cubic meters in 2003 because of the development of the Temane Gas Project. Sasol Ltd. of South Africa, which operated the project, exported gas from Temane through an 865-kilometer (km) pipeline to supply its South African chemical plants. The Mozal smelter and other Mozambican industrial establishments were expected to purchase gas from Temane and Pande in the future. Sasol planned to increase production to 3.1 billion cubic meters per year by 2008 (Sasol Ltd., 2004).

In June 2005, Sasol was awarded licenses to explore Blocks 16 and 19 for natural gas and petroleum. These blocks were located offshore to the east of the Pande and the Temane gasfields. The licenses were valid for 8 years, with a 25-year extension available depending upon the exploration results. Sasol planned to spend $7 million during the first phase of exploration (Mozambique News Agency, 2005a).

Petroleum.—Mozambique produced neither crude petroleum nor refined petroleum products and relied on imports. In March 2005, PetroSA of South Africa decided not to pursue a joint-venture agreement with Det Norske Olje-Selskap of Norway to explore for petroleum in the Inhaminga onshore block north of Beira. Petronas of Malaysia held an offshore exploration block near the Zambezi Delta.

Uranium.—The Mavuzi Mine in northwestern Mozambique produced uranium during the 1950s. In late 2005, OmegaCorp Ltd. of Australia resumed exploration at Mavuzi; further exploration was expected in 2006.

Infrastructure

Hidroelectrica Cahora Basa (HCB) [the Government of Portugal, 82%, and the Government of Mozambique, 18%] produced most of Mozambique's electricity. The company operated the Cahora Bassa hydroelectric plant, which had a capacity of 2,075 MW. In November, the Governments of Mozambique and Portugal signed a memorandum of understanding to increase the share of the Mozambican Government in HCB to 85% and reduce the share of the Portuguese Government to 15%. Under the agreement, the Portuguese Government would receive $950 million (Mozambique News Agency, 2006; Organization for Economic Cooperation and Development, 2006, p. 395).

The Mozal smelter consumed 900 MW of capacity; an additional 500 MW was likely to be consumed if the Mozal 3 project proceeds. All district capitals were expected to be connected to the national power grid by 2010. Hydropower projects proposed to meet future demand for electricity included Mepanda Ncua, with a capacity of 1,300 MW; Cahora Bassa, 850 MW; Lupata, 650 MW; and Boroma, 150 MW. The Moatize coal-fired power station would have a capacity of 1,500 MW (Hill, 2006; Mozambique News Agency, 2006).

Ircon International of India and Rites Ltd. of India were engaged in rebuilding the 650-km rail line from Beira to Tete, which linked the Moatize Mine to the Port of Beira. Rehabilitation was expected to be completed in early 2009. The rail line has been inoperable since 1984 because of civil unrest and a lack of funds for rehabilitation; the World Bank agreed to provide $130 million in funding (Mozambique News Agency, 2005b).

Spoornet of South Africa, which was a state-owned company, held the lease to the rail line from Maputo to Ressano Garcia on the border with South Africa. In 2005, the Government of Mozambique canceled the lease because Spoornet had not invested $10 million to rehabilitate the rail line. The lease was subsequently awarded to state-owned Portos e Caminhos de Ferro de Moçambique (CFM); the company planned to rehabilitate the rail line in 2006 (Organization for Economic Cooperation and Development, 2006, p. 396).

Outlook

The International Monetary Fund (2006, p. 184) predicted that Mozambique's GDP would increase by 7.9% in 2006 and 7% in 2007. The Moma Mine was likely to increase economic growth in 2006 and 2007; the outlook for titanium minerals in Mozambique depended heavily upon global market trends. The Moatize Mine could boost economic growth in 2009; the development of the mine depended upon global market trends and the rehabilitation of rail and port infrastructure. Development of the Corridor Sands and the Mozal 3 projects depended upon reliable power supplies. Demand for construction materials could increase in 2006 because of road and bridge rehabilitation; the development of the Corridor Sands, Moatize, and Mozal 3 projects could also lead to growth in the construction sector.

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TABLE 1
MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
Aluminum:						
Bauxite		8,592	9,119	11,793	6,723	9,518
Metal, refined		266,000	273,000	407,000	549,000	555,000
Beryl	kilograms	800	54,300	78,300	45,200	146,300
Cement, hydraulic	thousand metric tons	265	285	362	370 [r, e]	400 [e]
Clays:						
Bentonite:						
Crude		1,357	--	--	3,336	--
Processed		254	580	684	578	547
Brick		63,125	84,024	100,176	108,231	32,031
Coal, bituminous		27,600	43,512	36,742	16,525	3,417
Columbium (niobium) and tantalum, columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	27,000	46,900	188,695	712,095	281,212
Nb content[e]	do.	3,300	5,500	23,000	87,000	34,000
Ta content[e]	do.	7,700	13,000	54,000	205,000	81,000
Diatomite		--	--	--	3,000 [e]	4,500 [e]
Gemstones:						
Aquamarine	kilograms	47	26	8	18	16
Dumortierite		50	40	65	113	10
Garnet	kilograms	--	1,136	440	2,686	2,172
Tourmaline	do.	18	124	581	1,570	245
Gold[2]	do.	22	17	63	56	63
Natural gas	million cubic meters	1	2	1	1,295	2,316
Quartz	kilograms	24,765	31,363	30,985	173,478	--
Salt, marine[e]		10,000	80,000	80,000	80,000	80,000
Sands	cubic meters	464,684	795,813	1,372,032	1,429,743	833,113
Stone:						
Granite	do.	662	670	539	521	2,198
Gravel and crushed rock	do.	503,716	795,733	800,000 [e]	800,000 [e]	800,000 [e]
Limestone		729,230	1,301,232	1,348,372	1,593,450	654,179
Marble:						
Block	cubic meters	320	453	452	617	509
Slab	square meters	15,303	9,980	10,227	13,666	12,318

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Data available through June 13, 2006.

[2] Does not include unreported production; total output of gold was estimated to be roughly 600 to 900 kilograms per year.

TABLE 2
MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity[1]
Aluminum		Mozal SARL (BHP Billiton Ltd., 47.11%)	Maputo	506,000.
Bauxite		E.C. Meikles (Pty) Ltd. of Zimbabwe	Monte Snuta	12,000.[e]
Bentonite		Cia Desenvolvimento Mineira[2]	Boane	17,000.[e]
Cement		Cimentos de Mocambique, SARL (Cimentos de Portugal, SGPS, SA (Cimpor), 65.4%)	Dondo, Matola, and Nacala	730,000.
Do.		ARJ Group	Nacala	250,000.
Coal, bituminous		Carbomoc	Chipanga XI Mine at Moatize	60,000.
Columbium (niobium) and tantalum, columbite-tantalite, ore and concentrate	kilograms	Fleming Family & Partners	Marropino	315,000[e] concentrate; 110,000 Ta_2O_5. 47,000 Nb_2O_5.[e]
Do.	do.	Central African Mining and Exploration Company plc (CAMEC)	Zambezia Province	155,000 concentrate; 54,000 Ta_2O_5.
Do.	do.	Hegemony Resources	Naquissupa	NA.
Gold	do.	Artisanal Miners	Manica District	600.
Garnet	do.	Sociedade Mineira de Cuamba EE	Cuamba	4,400.[e]
Graphite		Kenmare Resources plc[3]	Ancuabe	10,000.
Marble, block	cubic meters	Marmonte E.E.	Montepuez	1,500.
Natural gas	million cubic meters	Sasol Ltd. (50%)	Temane	3,100.

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] Abbreviations used in this table for commodities include the following: Nb_2O_5--columbium (niobium) oxide; and Ta_2O_5--tantalum oxide.

[2] Not operating in 2005.

[3] On care and maintenance since 1999.

TABLE 3
MOZAMBIQUE: MINERAL RESOURCES IN 2005[1]

Commodity	Deposit	Tonnage	Grade	Mineral content
Bentonite	Boane	7.1 Mt	NA	NA.
Beryllium	Monea, Morrua, and Muiane	NA	NA	3,100 t BeO.
Coal	Minjova	7,100 Mt	NA	NA.
Do.	Mucanha-Vuzi	3,600 Mt	NA	NA.
Do.	Moatize	2,400 Mt	NA	NA.
Do.	Maniamba	230 Mt	NA	NA.
Columbium (niobium) and tantalum	Marropino	22 Mt	108 g/t Nb_2O_5; 254 g/t Ta_2O_5	2,400 t Nb_2O_5; 5,600 t Ta_2O_5.
Do.	Morrua	7.5 Mt	88 g/t Nb_2O_5; 661 g/t Ta_2O_5	660 t Nb_2O_5; 5,000 t Ta_2O_5.
Do.	Muiane	2 Mt	320 g/t Ta_2O_5	640 t Ta_2O_5.
Gold:				
Placer	Chimezi, Inhamurra, Muza, and Revue Rivers	110 million cubic meters	0.25 grams per cubic meter	28 t Au.
Lode	Chimezi, Chua, Mangota, and Penhalonga/Revue	3.5 Mt	6.7 g/t Au	23 t Au.
Do.	Manica	5.3 Mt	4.8 g/t Au	25 t Au.
Graphite	Cabo Delgado Province	33 Mt	15% graphite	5 Mt graphite.
Do.	Satemua	5.6 Mt	6.3% graphite	350,000 t graphite.
Natural gas	Pande and Temane	130 billion cubic meters	NA	NA.
Titanium and zirconium	Corridor Sands:			
Do.	West Block	1,800 Mt	4.14% ilmenite; 0.02% rutile; 0.15% zircon	73 Mt ilmenite; 350,000 t rutile; 2.6 Mt zircon.
Do.	East Block	910 Mt	3.8% ilmenite	34.5 Mt ilmenite.
Do.	Other areas	14,000 Mt	NA	NA.
Do.	Moma	2,370 Mt	3% ilmenite; 0.08% rutile; 0.25% zircon	72 Mt ilmenite; 2 Mt rutile; 6 Mt zircon.

NA Not available.

[1] Abbreviations used in this table for commodities include the following: Au--gold; BeO--beryllium oxide; Nb_2O_5--columbium (niobium) oxide; and Ta_2O_5--tantalum oxide. Abbreviations used in this table for units of measurement include the following: g/t--grams per metric ton; Mt--million metric tons; and t--metric tons.

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THE MINERAL INDUSTRY OF NAMIBIA

By Philip M. Mobbs

Diamond remained the most economically significant mineral commodity produced by the mining industry of Namibia. The country, which is located on the southwestern coast of Africa, was the world's sixth ranked producer of uranium and the eighth ranked producer of gem diamond. In 2005, diamond production declined slightly compared with that of 2004 because of a 21% reduction in Namdeb Diamond Corp. (Pty) Ltd.'s land-based diamond production and the half-year suspension of offshore mining by Diamond Fields International Ltd. as its MV *Diamond Fields Discover* (formerly the MV *Anya*, which had mined Diamond Fields' offshore concessions under contract) was renovated. Other mineral production in Namibia included copper, fluorspar, gold, lead, salt, semiprecious stones, silver, stone, and zinc (Olson, 2006; World Nuclear Association, 2006§[1]).

Based on purchasing power parity estimates published by the International Monetary Fund (2006§), Namibia's gross domestic product (GDP) was $15.1 billion in 2005 and the GDP per capita was about $7,478. The real GDP growth rate declined to 3.5% from 4.2% in 2004, and inflation dropped to 2.4% in 2005 from 4.1% in 2004.

Commodity Review

The rise of international prices of most mineral commodities continued in 2005 and sparked additional international interest in Namibian mineral occurrences. Copper exploration activity in Namibia included that of Copper Resources Corp. on the Haib project and Helio Resource Corp. on the Leicester, the Otjitombo, and the Tevrede South prospects. Diamond exploration included the offshore activity of Afri-Can Marine Minerals Corp. on Block J and the joint venture of Epia Minerals (Pty.) Ltd. and Trans Hex Group Ltd. on the Namdeb concessions. Other diamond exploration included that of Motapa Diamonds Inc. on the Kavango prospect, Mount Burgess Mining N.L. on the Tsumkwe project, Namibian Resources plc on the East and West Saltztal prospects, and Reefton Mining N.L. on the Skeleton Coast project. Companies that explored for gold in 2005 included AfriOre Ltd. on the Capricorn project, Teal Exploration & Mining Inc. on the Otjikoto prospect and in the Otavi area, and Yale Resources Ltd. on the Makuru project. Evaluation of uranium mineralization in Namibia included that of Australian United Gold Ltd. in the Engo Valley, Bannerman Resources Ltd. on the Goanikontes prospect, Forsys Metals Corp. (formerly Forsys Technologies Inc.) on the Valencia project, Reefton Mining N.L. on the Erango project, Rössing Uranium Ltd. on the SH and SK anomalies on Rössing's mining lease near Arandis, and Uranco Inc. on the Trekkopje deposit.

Metals

Copper.—In 2005, Ongopolo Mining and Processing Ltd. reopened the Matchless Mine, which had been closed in 1983. Ongopolo also operated the Tsumeb copper smelter and the Kombat and the Otjihase copper-lead-silver mines.

Industrial Minerals

Diamond.—Namdeb, which was a joint venture between De Beers Centenary AG (50%) and the Namibian Government (50%), was the country's leading diamond producer. During 2005, Namdeb, its contractors, and its subsidiaries produced about 1.7 million carats. Namdeb's offshore production of diamond exceeded onshore production for the first time since the 1923 diamond agreement between De Beers' and the Government's predecessors. The decline of onshore diamond production was attributed to the exhaustion of economic ore in Diamond Area no. 1, the Daberas terraces of the Orange River Mines, and Site 2 of the Pocket Beaches unit. Despite the decline in onshore production, Namdeb proposed to increase total company production to 10 million carats per year by 2010 (Namdeb Diamond Corp. (Pty) Ltd., 2006, p. 8, 21, 24-25).

Mineral Fuels

Uranium.—In 2005, Paladin Resources Ltd. began construction of the Langer Heinrich open pit uranium mine. Rössing, which had been Namibia's only uranium operation, processed about 12 million metric tons of ore in 2005 and produced 3,711 metric tons of U_3O_8. Whereas much of Rössing's production was exported under long-term contracts, excess production was sold in the international spot market. The increases in the spot market price (to $35.25 per pound in 2005 from $8.84 per pound in 2001) of the past few years had encouraged the company to evaluate an expansion of the mine; previously, the company had planned to close the mine in 2009. In December, Rössing confirmed that it would start a 2-year $112 million project that would include the purchase of new mining and transportation equipment and the rehabilitation of the process plant. Under the plan, Rössing would increase U_3O_8 production capacity to 4,000 metric tons per year and would extend operations at the facility to 2016 (Rössing Uranium Ltd., 2006, p. 2, 32).

Outlook

The long tradition of mining in Namibia has been renewed with the reopening of the Tsumeb-area copper mines and smelter in 2000, the opening of the Skorpion zinc project in 2003, the recent expansion of fluorspar and gold mines, and the continued success of offshore diamond exploration and development. The rise in world commodity prices during the

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[1] References that include a section mark (§) are found in the Internet References Cited section.

early 2000s has resulted in plans for additional exploration in Namibia for base metals, diamond, gold, natural gas, and uranium. Potentially new mine development and new value-added gemstone cutting and polishing, metal-processing, and other mineral-based manufacturing industries could maintain the minerals sector's position as a significant segment of the economy of Namibia for the foreseeable future.

With a climate that is among the driest in the world, the lack of water resources will continue to be a constraint on development in Namibia. New investment to develop the country's natural gas resources and to harness the hydroelectric power potential of the Kunene River will influence the future economic growth of Namibia. The expansion of regional transportation infrastructure in northern Namibia could see the Port of Walvis Bay become an alternative route for minerals exports from southeastern Angola, Botswana, and Zambia.

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TABLE 1

NAMIBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
METALS						
Arsenic, white, 99% arsenic trioxide		914	880	389	1,264	89
Copper:						
Mine output, concentrate (26% - 30% Cu):						
Gross weight		53,790	63,997	64,882	58,792	40,542
Cu content		12,393	18,012	16,175	11,174	10,157
Metal, blister:						
From domestic concentrates		18,386	17,850	16,106	15,500 r, e	14,600 e
From imported toll concentrates		8,629	8,853	9,930	9,200 r, e	9,000 e
Total		27,015	26,703	26,036	24,704	23,551
Gold	kilograms	2,706	2,815 r	2,508	2,205	2,703
Lead, mine output, concentrate:						
Gross weight		25,565	24,140	31,453	27,338	24,689
Pb content of Pb and Pb/Zn concentrates		12,088	13,809	18,782	14,338	14,320
Silver:						
Mine output, Ag content of concentrate	kilograms	20,396	43,632	45,100	27,153	30,003
Metal, refined, primary[2]	do.	18,150	12,020	18,140	14,815	15,000
Tantalite:						
Gross weight, concentrates		--	23 e	100 e	30 e	--
Ta content (36%)		--	8	36	11 e	--
Tin:						
Gross weight, concentrates		--	--	72	25 e	--
Sn content (60%)		--	--	43	15 e	--
Uranium, U_3O_8		2,640	2,751	2,401	3,583	3,711
Zinc, mine output, concentrate (49% - 54% Zn):						
Gross weight		70,923	77,587	107,920	123,372	126,123
Zn content of Zn and Pb/Zn concentrates		37,622	42,685	60,500	66,028	68,000 e
Metal, refined, primary[2]		--	35	47,436	120,533	132,818
INDUSTRIAL MINERALS						
Diamond, gem	thousand carats	1,487	1,562	1,481	2,004	1,902
Fluorspar, acid grade (97% $CaFl_2$)[3]		81,551	81,084	79,349	104,785	84,211
Gypsum		--	--	--	--	--
Salt		543,218	630,159	697,914	754,351	573,248
Semiprecious stones:						
Agate		138	190	123	158	150
Amethyst	kilograms	4,500 e	4,500 e	300	41,367	40,000
Blue chalcedony	do.	NA	NA	124	69	50
Chrysocolla	do.	2,685	13	-- e	--	--
Garnet	do.	150 e	150 e	--	115	100
Picture stone		NA	NA	326	240	200
Pietersite		5,370	--	11	9	--
Rose quartz		30	--	93	--	--
Sodalite		46	1,691	174	--	--
Tourmaline	kilograms	--	--	218	102	100
Stone:						
Dolomite		19,593	--	15,401	13,536	14,000 e
Granite		5,723	24,754	27,456	25,492	21,380
Marble		18,337	3,182	4,523	8,356	5,112
Sodalite		--	NA	704	138	100
Sulfur, pyrite concentrate:						
Gross weight (49% - 51% S)		68,674	3,633	31,786	3,658	1,035
S content		34,491	1,874	16,390	1,835	520
Wollastonite		284	742	585	406	253

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through October 31, 2006.

[2] Includes products of imported concentrate.

[3] Fluorspar production shown in wet metric tons; approximately 9% moisture.

THE MINERAL INDUSTRY OF NIGERIA

By Philip M. Mobbs

Nigeria, which was a member of the Organization of the Petroleum Exporting Countries (OPEC), was Africa's leading unprocessed petroleum (crude oil) producer. In 2005, Government revenue from hydrocarbons soared to $35.6 billion[1] and accounted for 86% of total Government revenues; in 2004, Government natural gas and petroleum revenues were $25.1 billion. The increase in hydrocarbon revenues in 2005 was attributed to the rise in international oil prices. Some of the increase in international prices had been attributed to the civil unrest in Nigeria, which introduced additional uncertainty into the world supply of crude oil (Central Bank of Nigeria, 2006, p. 164, 201; Power and Interest News Report, 2006§[2]).

In 2005, the growth of Nigeria's gross domestic product (GDP) at constant prices was estimated to be 6.9%. The GDP based on purchasing power parity was estimated to be about $174 billion, and the GDP per capita based on purchasing power parity was estimated to be about $1,188. Despite the nation's significant petroleum income, Nigeria was 165th on a list of 180 countries ranked by GDP per capita by the International Monetary Fund. Nigeria's GDP per capita rank was skewed by its position as the most populous country in Africa. Estimates of Nigeria's population in 2005 varied from about 132 million to about 146 million (Central Bank of Nigeria, 2006, p. 175; International Monetary Fund, 2006§; World Bank Group, 2006§).

In addition to hydrocarbons, artisanal miners and companies produced columbium (niobium), gold, lead, tantalum, tin, and zinc ores; and other minerals and mineral-based commodities, such as barite, cement, clays, coal, copper, feldspar, gemstones, gypsum, lead, phosphate rock, steel, stone, and tin.

Government Policies and Programs

In 2005, proposed amendments to the Mining and Minerals Decree No. 34 of 1999 were under consideration by the Legislature and the Ministry of Solid Mineral Development. Under the Mining Law, the Federal Government holds all mineral rights. In November, the Government and the State governments agreed to close all State government mineral development agencies because the existence of the State organizations effectively usurped the Federal Government's statutory powers in the solid minerals development arena (Onuorah, 2005§).

Trade

In 2005, total official exports were provisionally valued at about $47.9 billion, of which the value of crude oil exports was estimated to be $46.8 billion. The value of natural gas exports was estimated to be $456 million. Hydrocarbon exports accounted for 98.5% of total Nigerian exports. According to the Central Bank of Nigeria (2006, p. 201) official crude oil exports declined by about 5.8% in 2005 compared with 2004. Of the total official crude oil exports in 2005, about 47% was shipped to the United States, 11% to India, 6% to countries of West Africa, 5% to Spain, and 5% to Canada.

Commodity Review

Metals

Iron and Steel.—In 2005, Global Infrastructure Holding Co. (GIHL) of India acquired Delta Steel Co. from the Bureau of Public Enterprises (BPE), which managed the Federal Government's privatization program. Delta Steel subsequently restarted production of pellets from stockpiled iron ore, crude steel, and rolled steel products. GIHL also acquired the Ajaybanko and the Itakpe iron ore deposits (formerly held by the National Iron Ore Mining Co. Ltd.) from the BPE. Iron ore production was expected to resume in 2006. In 2005, the BPE accepted bids to privatize the steel-rolling mill at Jos from Zuma Steel West Africa Ltd. and the rolling mill at Oshogbo from Kura Holdings Ltd. The BPE rejected new bids for the rolling mill at Katsina.

Industrial Minerals

Nitrogen.—In 2005, the construction of a urea plant at Yenagoa, Bayelsa State, was proposed. A North American investor group was to fund the 1-million-metric-ton-per-year (Mt/yr)-capacity plant (Etim, 2005§).

Mineral Fuels

Natural Gas.—In November, Nigeria Liquefied Natural Gas Ltd. (NLNG) began production from liquefied natural gas (LNG) train 4. LNG train 5 was expected to begin production in early 2006. The construction of LNG train 6 at NLNG's facility at Finima on Bonny Island was underway; initial production was scheduled for 2007. Planning for NLNG's proposed 4.8-Mt/yr-capacity LNG train 7 began in 2005 (Scott, 2005§).

Petroleum.—Despite the civil violence directed at the international oil company facilities, intertribal conflicts that adversely impacted production operations, and repeated vandalism of domestic pipelines, Nigerian oil production continued to increase. The Nigerian National Petroleum Corp. (NNPC) estimated that about 200,000 barrels per day of crude oil was not produced because of the violence (Oduniyi, 2005§).

In 2005, initial crude oil production from offshore facilities included the deepwater (1,000 meters water depth) Bonga Field and the Okwori Field, which was operated by Addax

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[1] Where necessary, values have been converted from Nigerian Naira (N=) to U.S. dollars (US$) at the average rates of N=131.66=US$1.00 for 2005 and N=133.50=US$1.00 for 2004.

[2] References that include a section mark (§) are found in the Internet References Cited section.

Petroleum Exploration (Nigeria) Ltd. Shell Nigeria Exploration and Production Co. (55% interest) operated the Bonga Field for partners Esso Exploration and Production Nigeria Ltd. (20%), Nigerian Agip Exploration Ltd. (12.5%), and Elf Petroleum Nigeria Ltd. (12.5%), under a production-sharing contract with NNPC.

Outlook

The BPE plans to continue its privatization program in 2006. Mineral sector companies scheduled to be offered (or reoffered) to bidders include the Aluminum Smelter Co. of Nigeria Ltd., the Kaduna Refinery and Petrochemicals Co. Ltd., the Nigerian Gas Co., the new and the old refineries of Port Harcourt Refining Co. Ltd., and the Warri Refinery and Petrochemicals Co. Ltd.

The Government is expected to continue efforts to attract local and foreign investors to the Nigerian mineral industry, but except for coal, columbium (niobium) and tantalum, granite, gypsum, iron ore, limestone, natural gas, liquid hydrocarbons, and tin, known resources of most mineral commodities currently are not considered large enough to generate significant international interest. Civil unrest, which tends to mute international investor's interest in the Nigerian solid minerals sector, is expected to continue.

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TABLE 1

NIGERIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005
METALS						
Columbium (niobium) and tantalum concentrates:						
Gross weight		610	156 [4]	383 [4]	100	99
Columbium (niobium) content		250	65	160	40	35
Gold	kilograms	37 [4]	40	50	30	30
Iron ore, gross weight	thousand metric tons	25 [4]	25	--	--	--
Lead:						
Lead-zinc ore		247 [4]	250	250	200	200
Metal, refined		5,000	5,000	5,000	5,000	5,000
Steel		--	--	--	10,000	40,000
Tin:						
Mine output, cassiterite concentrate:						
Gross weight		3,677 [4]	1,004	2,341	1,300	1,000
Sn content		2,870 [4]	790	1,800	1,000	790
Metal, smelter		25	25	25	25	25
INDUSTRIAL MINERALS						
Barite[5]		5,000	5,000	5,000	6,000	6,000
Cement, hydraulic	thousand metric tons	2,400	2,100	2,300	2,300	2,400
Clays:						
Kaolin		209,478 [4]	200,000	200,000	210,000	200,000
Unspecified		60,474 [4]	60,000	60,000	50,000	50,000
Feldspar		1,811 [4]	1,800	1,800	1,700	1,700
Gypsum		609,800 [4]	300,000	100,000	100,000	100,000
Stone:						
Granite	thousand metric tons	2,419 [4]	2,500	2,500	2,000	2,000
Limestone	do.	3,392 [4]	11,415 [4]	7,408 [4]	2,100	2,100
Marble	do.	129 [4]	1,551 [4]	840 [4]	150	149
Shale	do.	163 [4]	130	130	70	70
Topaz	kilograms	1 [4]	10	10	10	10
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		11,495 [4]	43,482 [4]	23,089 [4]	9,000	9,000
Natural gas:						
Gross	million cubic meters	57,530 [4]	50,000	53,000	57,747 [4]	56,000
Dry	do.	39,640 [4]	30,000	31,000	34,411 [4]	34,744 [4]
Petroleum:						
Crude	thousand 42-gallon barrels	823,000	773,000	825,000	900,400 [4]	923,500 [4]
Refinery products:						
Liquefied petroleum gases	do.	1,000	2,300	2,000	2,200	7,100
Gasoline	do.	24,400	22,400	20,000	22,000	14,800
Kerosene	do.	12,500	11,800	12,000	13,000	10,100
Distillate fuel oil	do.	18,900	18,800	19,000	21,000	15,800
Residual fuel oil	do.	21,500	17,200	17,000	18,000	19,200
Unspecified	do.	700	4,000	4,000	4,300	4,400
Total	do.	79,000	76,500	74,000	80,500	71,400

-- Zero.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through November 29, 2006.

[3] In addition to the commodities listed, amethyst, aquamarine, bitumen, copper (secondary), diamond, emerald, garnet, lime, monazite, phosphate rock, ruby, rolled-steel products, rutile, sand and gravel, sapphire, soda ash, talc, tourmaline, tungsten, zinc, and zircon are produced, but information is inadequate to estimate output.

[4] Reported figure.

[5] Considerably more barite is produced but is considered to be commercially unusable.

THE MINERAL INDUSTRY OF RWANDA

By Thomas R. Yager

Rwanda's mineral industry produced gold ores and concentrates of columbium (niobium), tantalum, tin, and tungsten, most of which was designated for export. This small country in central Africa also reexported concentrates of columbium (niobium), tantalum, and tin that were produced in Congo (Kinshasa). Rwanda also produced cement, sapphire, and small quantities of natural gas, and was known to have deposits of beryllium, kaolin, and peat.

Coopérative de Promotion de l'Industrie Minière Artisanale, Régie d'Exploitation et de Développement des Mines (REDEMI), and other companies produced ores of columbium (niobium) and tantalum, tin (cassiterite), and tungsten (wolframite). REDEMI operated columbite-tantalite processing facilities at Gatumba. In 2005, exports of columbite-tantalite concentrates totaled 1,062 metric tons (t) at a value of $15.4 million. Columbite-tantalite accounted for nearly 14% of total exports in 2005 compared with 13% in 2004 and 45% in 2001 (Banque Nationale du Rwanda, 2006b).

REDEMI operated a cassiterite-processing facility at Rutongo; the company produced 205 t of cassiterite in 2004 compared with 168 t in 2003. Rwanda's exports of cassiterite totaled 4,532 t at a value of about $16.3 million in 2005, most of which was reexported from Congo (Kinshasa). Cassiterite accounted for 14% of total exports in 2005 compared with 16% in 2004 and 1% in 2001 (Global Witness, 2005, p. 24; Banque Nationale du Rwanda, 2006b).

Metal Processing Association operated a cassiterite-processing facility and a tin smelter at Gisenyi. The smelter produced about 200 metric tons per year of tin from cassiterite imported from Congo (Kinshasa) (Global Witness, 2005, p. 19).

REDEMI operated a wolframite-processing facility at Nyakabingo. Exports of tungsten ore (wolframite) amounted to 557 t at a value of about $2.34 million in 2005, or 2% of total exports. From 2001 to 2004, wolframite accounted for less than 1% of national exports (Banque Nationale du Rwanda, 2006b).

Cimenterie du Rwanda (Cimerwa) was Rwanda's only producer of cement. In the first 6 months of 2005, the company's production declined by 4% because of power shortages and high fuel oil prices (Kakimba, Majyambere, and Nuwamanya, 2005).

Rwanda produced small amounts of natural gas at Cape Rubona on the shore of Lake Kivu. In 2005, Dane Associates Ltd. signed an agreement with the Government for the construction of a new 35-megawatt power station that would use natural gas extracted from Lake Kivu. Dane Associates planned to start natural gas production at the facility in early 2006 (Reuters Ltd., 2005).

Rwanda did not have production facilities for petroleum products; all petroleum demand was met through imports. In 2005, the value of imported energy products and lubricants amounted to $44.8 million; energy imports accounted for 12% of Rwanda's total imports (Banque Nationale du Rwanda, 2006a).

Outlook

The outlook for the mineral industry of Rwanda depends on favorable world market conditions for columbium (niobium), gold, tantalum, tin, and tungsten, and on reduced civil strife and political risks in Rwanda's Great Lakes region. The development of domestic natural gas resources could reduce reliance on imported petroleum products and result in more reliable power supplies for mining and mineral-processing operations.

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TABLE 1
RWANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
Cement		91,204	100,568	104,613	104,205 [3]	100,000
Columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	241,000	96,000	128,000	200,000	250,000
Nb content	do.	76,000	30,000	40,000	63,000	80,000
Ta content	do.	53,000	20,000	26,000	40,000	50,000
Gold, mine output, Au content	do.	10 [e]	10 [e]	2	--	--
Natural gas, gross	thousand cubic meters	828	103	314	320	320
Tin:						
Mine output, Sn content		169	197	192	547 [r]	700
Refined[e]		-- [3]	40 [r]	200 [r]	200 [r]	200
Tungsten, mine output, W content		142	153	78	120	200

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through October 25, 2006.

[2] In addition to the commodities listed, sapphire and pozzolanic materials are also known to be produced, but information is inadequate to make reliable estimates of output.

[3] Reported figure.

TABLE 2
RWANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity[1]
Cement	Cimenterie du Rwanda	Plant at Cyangugu	115,000.
Columbium (niobium) and tantalum	Régie d'Exploitation et de Développement des Mines	Concentrator at Gatumba	20 Nb_2O_5 and Ta_2O_5 in concentrate.[e]
Gold	Artisanal miners	Mines in Nyungwe Forest	NA.
Sapphire	do.	Mines at Cyangugu	NA.
Tin	Régie d'Exploitation et de Développement des Mines	Concentrator at Rutongo	370 in concentrate.[e]
Do.	Metal Processing Association	Concentrator at Gisenyi	NA.
Do.	do.	Smelter at Gisnyi	200.
Tungsten	Régie d'Exploitation et de Développement des Mines	Concentrator at Nyakabingo	170 in concentrate.[e]

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] Abbreviations used for commodities in this table include the following: Nb_2O_5--niobium pentoxide and Ta_2O_5--tantalum pentoxide.

THE MINERAL INDUSTRY OF SIERRA LEONE

By Omayra Bermúdez-Lugo

The Republic of Sierra Leone, which is located in West Africa, is bordered by the Atlantic Ocean to the west, Guinea to the north and northeast, and Liberia to the southeast. In 2005, the population was estimated to be about 6 million and was growing at an estimated rate of about 2.22%. The country's total land area is 71,620 square kilometers (km^2) (U.S. Central Intelligence Agency, 2005§[1]). The country's estimated gross domestic product (GDP) based on purchasing power parity was about $4.9 billion in 2005; the per capita GDP based on purchasing power parity was about $903 (International Monetary Fund, 2006§). Mineral commodities produced in Sierra Leone included cement, diamond, and gold.

According to the Central Bank of Sierra Leone, the mining sector, which was dominated by diamond mining, was the main source of foreign exchange to the economy (Bank of Sierra Leone, 2006, p. 3). About 90% of diamond exports was produced by artisanal miners. Most of the country's diamond was exported to Belgium, the United Kingdom, and the United Sates (The Diamonds and Human Security Project, 2005).

Government Policies and Legislation

Mining in Sierra Leone was regulated by the Mines and Minerals Amendment Act of 1994 and by the Mines and Mineral Amendment Act of 2003. The Petroleum Act of 2001 regulated petroleum activities. In 2003, a new "Core Mineral Policy" that was designed to revive the mining sector was established by the Ministry of Mineral Resources (MMR). The MMR was responsible for the administration of the mineral industry, the issuance of mining licenses, field monitoring, enforcement, and the maintenance of mining records. The Gold and Diamond Department of the National Revenue Authority was responsible for implementing Sierra Leone's participation in and compliance with the international diamond trade control requirements of the Kimberley Process Certification Scheme (Coakley, 2004, p. 34.1; Sierra Leone Ministry of Mineral Resources, 2006§).

The MMR established the Diamond Area Development Fund (DACDF) in an effort to stop illegal diamond mining activities and smuggling. Through the DACDF, a mining community will have the opportunity to obtain a small percentage of diamond export taxes, a portion of which is to be disbursed to the chiefdom of each community. The Government believed this system will provide an incentive for communities to combat illegal mining activities (The Diamonds and Human Security Project, 2006).

Environment

An estimated 800 to 1,200 km^2 (reported as 80,000 to 120,000 hectares) of land has been mined out in Sierra Leone and almost no effort has been made toward reclamation. Artisanal mining is largely unregulated and, according to Partnership Africa Canada, diamond mining practices have, over time, led to massive deforestation, health problems, and loss of biodiversity. The Government requires a fee of only $50 from mining license holders for environmental rehabilitation and, although the Core Mineral Policy states that artisanal mining plots should not exceed 176 square meters (m^2) (reported as 210 square yards), some mines often comprise several plots that cover areas as large as about 100,000 m^2 (reported as 25 acres) (The Diamonds and Human Security Project, 2005).

An environmental impact assessment carried out in 2003 for Koidu Holdings Limited (KHL), which was the only kimberlite mining operation in the country, established that residents living in the vicinity of the company's mining operations could be adversely affected by blasting. The results of the study called for the relocation of about 4,500 residents. A dispute between the residents and KHL concerning property rights was resolved in May 2005 when an agreement was reached under which new houses were to be constructed by community residents, and KHL was to bear the cost of construction materials, labor, and supervision (The Diamonds and Human Security Project, 2005; 2006).

Trade

Mineral exports, which accounted for about 90% of Sierra Leone's total export earnings, increased by about 12.6% to nearly $142.5 million in 2005; 99.8% of these earnings was from diamond exports (Bank of Sierra Leone, 2006, p. 21). Most diamond exporters in Sierra Leone were said to be foreign nationals of Lebanese descent, many of whom fund artisanal miners and diamond dealers in the country (The Diamonds and Human Security Project, 2005). Partnership Africa Canada reported that the value of official exports could be much higher were it not for smuggling; about 50% of production was thought to be smuggled out of the country (The Diamonds and Human Security Project, 2005).

According to U.S. Census Bureau foreign trade statistics, Sierra Leone's exports to the United States were valued at about $9.4 million in 2005 compared with about $10.9 million in 2004 and $6.5 million in 2003; $5.1 million of these exports was from gem-quality diamond and $1.1 million, from bauxite and aluminum (U.S. Census Bureau, 2006b§). Imports from the United States were valued at about $37.8 million in 2005 compared with about $40.6 million in 2004 and $28.2 million in 2003. These included nearly $2.8 million for excavating machinery and $453,000 for drilling and oilfield equipment (U.S. Census Bureau, 2006a§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Commodity Review

Metals

Bauxite and Alumina.—Argyll Resources Corporation of the United Kingdom signed a memorandum of understanding with the Government to restart bauxite mining in the Kambia District. The company was to invest $1.6 billion to mine bauxite and build a 1.4- to 1.5-million-metric-ton-per-year (Mt/yr) alumina plant (Metal Bulletin, 2005; Bank of Sierra Leone, 2006, p. 3; Angola Press, 2005§).

On January 20, 2005, Moydow Mines International Inc. of Canada announced that it had signed an agreement with Gondwana Investments S.A. (a Luxemburg-based company) to acquire a majority interest in the Porto Loko bauxite deposit in Sierra Leone. Moydow had the option to acquire an initial 49% interest in Porto Loko by investing $600,000 in exploration and could acquire up to 60% interest in the project either by investing an additional $400,000 on exploration or by conducting a feasibility study. According to Moydow, previous exploration on the property had outlined a resource of about 100 Mt of bauxite at an average grade of 47% Al_2O_3. In addition, Moydow was to grant Gondwana 150,000 shares and 200,000 options for a period of 2 years (Moydow Mines International Inc., 2005; 2006§).

Sierra Mineral Holdings I Ltd. (SMHL) (a subsidiary of Titanium Resources Group Ltd.) held a bauxite mining license for a 580-km^2 area in southwestern Sierra Leone that was located about 150 kilometers (km) southeast of Freetown. The mining license, which was for a period of 10 years, included the restarting of bauxite mining operations and the refurbishment of existing infrastructure at Gondama and at the Nitti Port facilities. In 2005, SMHL announced that the refurbishment program was underway and that the company had entered into a long-term sales agreement with Alcoa World Alumina LLC of the United States and Glencore AG (a subsidiary of Glencore International AG) of Switzerland to sell the project's full annual production, which was estimated to be 1.2 Mt/yr of bauxite. Production was expected to begin during the first quarter of 2006. The mined bauxite would be processed locally and then loaded onto 2,000-metric-ton (t)-capacity barges and moved down the Sherbro River to the Atlantic Ocean for shipping (Mining Journal, 2005; Titanium Resources Group Ltd., 2005a; Australia's Paydirt, 2006).

Gold.—Mano River Resources Inc. of the United Kingdom in joint venture with Golden Star Resources Ltd. of the United States continued to explore for gold at the Nimini, the Pampana, and the Sonfon properties. Between October 2004 and May 2005, nearly 5,300 soil samples were collected from within all three properties to conduct a soil geochemistry survey. On November 18, 2005, following the completion of the survey, Mano River announced two new gold discoveries—one at the Pampana property, which is located about 150 km east of Freetown, and the other at the Sonfon property, which is located about 175 km northeast of Freetown. Followup drilling at both properties was scheduled to begin during the third quarter of 2006. The initial phase of the project was to be funded by Golden Star at a cost of $750,000 (Mano River Resources Inc., 2006, p. 5).

In October, Cluff Gold plc announced the completion of its 4,600-meter drilling program at the Baomahun gold prospect. The Baomahun gold prospect is located in Sierra Leone's Southern Province about 180 km east of Freetown. Cluff reported a resource estimate of 4.54 Mt of ore at an average grade of about 3.6 grams per metric ton (g/t) gold. Cluff Gold UK Limited (a subsidiary of Cluff Gold plc) could earn a 60% interest in the Baomahun project from Winston Mines Ltd. by spending $5 million or by completing a bankable feasibility study (Cluff Gold plc, 2005a, b; 2006, p. 4).

Titanium.—Before the start of the civil war, which led to the closing of the Sierra Rutile Mine in 1995, Sierra Leone was one of the world's leading producers of ilmenite and rutile. In early 2005, Sierra Rutile Limited (SRL) (a company owned by Titanium Fields Resources Limited and U.S. Titanium LLC) began the refurbishment of Dredge DI and of the associated infrastructure of the Sierra Rutile Mine, which was scheduled to be reopened in 2006. Dredge DI was expected to produce about 100,000 t/yr of rutile during the first phase of operation and to increase production to about 200,000 t/yr of rutile during the second phase. SRL planned to produce standard-grade rutile, which would be destined mainly for consumption in the manufacturing of titanium dioxide pigments and titanium sponge, and industrial grade rutile, which would be destined mainly for the welding rod, thermal insulation, and ceramics markets. The company announced that it had signed sales contracts (buyers names not disclosed) for more than one-half of SRL's future production (Titanium Resources Group Ltd., 2005b; 2006, p. 5).

In December 2005, Titanium Resources Group Ltd. signed an $120,000 agreement with Gondwana to acquire the Rotifunk mineral sands prospect, which is located about 65 km southeast of Freetown and 40 km northwest of the Sierra Rutile Mine. Titanium Resources reported that previous exploration at the prospect, which was undertaken during 2003 and 2004 by Gondwana, had outlined inferred mineral resources of about 170 Mt that contained 0.84% ilmenite, 0.70% rutile, and 0.06% zircon. Titanium Resources planned to evaluate the potential of the Rotifunk prospect further in 2006 (Titanium Resources Group Ltd., 2005c).

Industrial Minerals

Cement.—Cement production decreased to 172,130 t from a revised 180,460 t in 2004 owing to a breakdown at the Sierra Leone Cement Corporation Ltd. (SLCC) production plant in Freetown in March 2005. According to the Central Bank of Sierra Leone, the domestic demand for cement increased markedly during the first half of 2005. To meet such demand, SLCC had to import about 14,300 t of cement during the year. The company installed a new production cement plant in August 2005 (Bank of Sierra Leone, 2006, p. 6).

Diamond.—Diamond production decreased by about 3.5% to 668,710 carats in 2005 from 693,104 carats produced in 2004; 393,790 carats were gem quality (Bank of Sierra Leone, 2006, p. 7-8). As of the end of 2005, about 2,400 diamond mining licenses had been issued in the country. Most diamond production came from alluvial deposits; mining from kimberlite pipes began in 2003. As of 2005, only Koidu Holdings S.A. (KHSA) was engaged in kimberlite mining. The Government's revenues from the diamond sector came from license fees, a corporate tax on KHSA, and export taxes (The Diamonds and Human Security Project, 2006).

In 2005, the number of artisanal miners in Sierra Leone was estimated to be more than 100,000; about 70% of artisanal diamond production came from the Kono District. The first diamond mining license in the Northern Province was issued in 2002; by 2004, diamond mining was reported in four of the Northern Province's five districts where kimberlite dykes were believed to exist. Sierra Leone Diamond Company Ltd. (SLDC) was conducting prospecting work in the Kamakwie area to assess the viability of such dykes. Overcrowding of the mining areas in the north by artisanal miners reportedly had caused a series of social and health problems, including outbreaks of cholera and other diseases, environmental degradation, diamond smuggling across the Guinean border, and the abandonment of agricultural activities for diamond mining (The Diamonds and Human Security Project, 2005).

SLDC had a number of subsidiaries that held prospecting and exploration licenses in Sierra Leone; these included Fatkad Mining Company Limited, Kangaroo Mining Company Limited, and Molans Mining Company Limited. SLDC held several exploration and prospecting licenses in Sierra Leone, the primary target of which were diamond-bearing kimberlite pipes and, secondarily, alluvial diamond, bauxite, gold, iron ore, rutile, and rare-earth minerals. The company's main exploration areas were Kamakwie, Kono, and Sewa River. Exploration blocks within these areas included the Coastal Block, the Gori Hills Block, the Northeast Block, the Northwest Block, and the Sewa River Block. In 2005, the company completed high-resolution aeromagnetic surveys at each of these areas. A total of 146 targets in the Northwest Block, 24 in the Sewa River Block, and 16 in the vicinity of the Marampa and the Tonkolili iron ore deposits were identified and scheduled for followup soil sampling and ground magnetometry. Drilling and bulk sampling for some of the targets was scheduled for 2006. In June 2005, the Government awarded SLDC an exclusive prospecting license for bauxite, diamond, gold, iron ore and rutile in the North Sula Tonkolili District and the Jambohun area and an exploration license in the Baoma District (Sierra Leone Diamond Company Limited, 2006, p. 6-10; The Diamonds and Human Security Project, 2006).

KHSA was a joint venture of Energem Resources Inc. (40%), Magma Diamond Resources Ltd. (35%), and the privately owned Geneva-based Beny Steinmetz Group (25%). The joint venture mined two kimberlite pipes in Koidu. In addition to the kimberlite pipes, KHSA was exploring three other properties, namely, the Matemu, the Middle and the Upper Sewa, and the Tongo Fields kimberlite dyke deposit. On May 24, the company announced the completion of a delineation drilling program for pipes 1 and 2, the updating of a three-dimensional (3-D) geologic model, and the completion of a bulk sampling trial mining program at Koidu. During the bulk sampling program, a total of 76,619 t of ore was mined from pipe 1 and yielded 34,679 carats, which was sold at an average price of $231 per carat; 200,214 t of ore was mined from pipe 2 and yielded 50,964 carats, which was sold at an average price of $187 per carat; 3,532 carats was produced from other sources, such as dykes and ramp areas, and sold at an average price of $169 per carat in addition to 11,604 carats of industrial-quality diamond, which was sold at an average price of $4 per carat. A technical report to update resource estimates at KHSA's properties in Sierra Leone was prepared by Venmyn Rand (Pty) Ltd. in 2005. Indicated and inferred resources for pipe 1 were estimated to be about 1.52 Mt of ore at an average grade of 0.55 carat per ton, or about 834,000 carats of diamond; indicated and inferred resources at pipe 2 were estimated to be about 2.9 Mt of ore at an average grade of 0.26 carat per ton, or about 760,000 carats of diamond; indicated resources at Dyke Zone A were estimated to be 455,000 t of ore at an average grade of 0.54 carat per ton, or about 246,000 carats of diamond, and indicated resources at Dyke Zone A Enlargement were estimated to be 82,000 t of ore at an average grade of 0.75 carat per ton, or about 61,500 carats of diamond. The preliminary estimates for the life of the mine of pipes 1 and 2 was 7 years (Energem Resources Inc. 2005; 2006§).

In January 2004, Mano River was awarded a 9,700-km^2 regional exclusive prospecting license in southeastern Sierra Leone and, in May, the company signed a joint-venture agreement with BHP Billiton (BHP) of Australia under which BHP could earn a 51% interest in the property by investing $3.4 million in exploration during a 3-year period. BHP could obtain up to a 71% interest by funding a feasibility study on potential kimberlite areas. By the end of March 2005, more than 800 heavy-mineral stream samples had been collected and sent to South Africa for analysis. Initial results yielded several kimberlitic mineral anomalies in the area, one of which included chromite, garnet, and ilmenite. In September, Mano River completed soil sampling and ground magnetic surveys of the anomaly but announced the suspension of fieldwork at the property owing to the advent of the rainy season (Mano River Resources Inc., 2004; 2005b, c).

Mano River (49%) also explored for diamond in joint venture with Petra Diamonds Limited (Petra), a South African-based company (51%) at the Lion dykes, which are located about 340 km east of Freetown in the Kono District. Petra completed the manufacturing of a 75-metric-ton-per-hour dense-media-separation and crushing plant in South Africa, which was to be shipped to Sierra Leone and commissioned during the first quarter of 2006 (Mano River Resources Inc., 2005a; Petra Diamonds Limited, 2006, p. 3, 16-17). Other companies that explored for diamond in Sierra Leone in 2005 included African Diamonds plc, Cream Minerals Ltd., and River Diamonds plc.

Mineral Fuels

Petroleum.—Sierra Leone did not produce or refine petroleum and was dependent upon imports for its petroleum requirements. Through an international tender held in 2003, the Government awarded Repsol YPF S.A. of Spain in joint venture with Woodside Petroleum Ltd. of Australia exploration licenses for offshore Blocks SL-6 and SL-7. In January 2005, Blocks LB-16 and LB-17 were also awarded to Repsol (Petroleum Economist, 2005).

Infrastructure

In 2005, production of electricity decreased by 37.22% to 53.25 gigawatts per hour (GW/hr) from 84.82 Gw/hr produced in 2004. The Government attributed the decrease to the continuous breakdown of old generator plants. In February 2005, the European Union provided about $2.7 million to assist the National Power Authority and, in August, the Government signed an $8 million loan agreement with the Arab Bank for Economic Development in Africa (BADEA) for Phase I of the Western Area Power Generation Project (WAPGP). The purpose of the WAPGP project was to build thermal plants that would add 50 megawatts (MW) to supplement the Bumbuna Hydro Electric Power Project (BHEPP). The $8 million loan was for the construction of a 7.5-MW subpower station at Blackhall Road that would supply electricity to eastern Freetown. The BHEPP was jointly funded by the African Development Bank, the International Development Association, the Italian Government, the Netherlands Clean Development Facilities, and the Organization of Petroleum Exporting Countries. A contract was signed with Salini Construttori Company for the completion of the BHEPP by 2007. In 2005, the Government also received a 7-MW diesel generator from the South African Government to increase electricity supply in Freetown; the generator was expected to be operational by 2006 (Bank of Sierra Leone, 2006, p. 3-4, 8-9; Republic of Sierra Leone, 2005§).

BADEA will also help finance the reconstruction of the Kenema-Koindu road in 2006 upon completion of a feasibility study. According to the Government, the Kenema-Koindu road was the route used by rebels to enter Sierra Leone from Liberia during the war and is of great economic importance to Sierra Leone given that it is also the transit corridor for cocoa and coffee crops and for some of the diamond fields (Republic of Sierra Leone, 2005§).

Reconstruction work on damaged public and private buildings and roads continued in 2005. The number of building permits issued throughout the year increased to 667 from 422 in 2004. Residential permits issued increased by 48.6% to 520, and commercial permits issued increased to 55 from 9 issued in 2004 (Bank of Sierra Leone, 2006, p. 9).

Outlook

The establishment of peace after more than 10 years of civil war; reconstruction efforts, which included the rehabilitation of buildings and roads; investments to increase electricity production capacity; the implementation of the Kimberley Process; the establishment of sanctions on Liberia, which was considered one of Sierra Leone's major diamond-smuggling routes; plans to restart bauxite and rutile mining; the beginning of mining from kimberlite pipes; and the presence of several foreign companies exploring for gold in the country in 2005 all seem to indicate that not only is the Government taking steps to revamp Sierra Leone's mineral industry, but that foreign companies seem to have developed confidence in the country's ability to do so. In the short run, Sierra Leone's economy is likely to continue to depend greatly on revenues from the diamond industry although, in the longer run, rutile production, which was Sierra Leone's top export commodity during the early 1990s, could also contribute significantly to future earnings. Political stability and the Government's commitment to promote foreign direct investment, however, is of utmost importance for the industry to develop. Parliamentary and Presidential elections are to be held in July 2007.

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TABLE 1
SIERRA LEONE: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		2001	2002	2003	2004	2005
Cement	metric tons	113,268	144,145	169,109	180,460 [r]	172,130
Diamond	carats	222,520 [2]	351,860 [2]	506,819 [2]	693,104 [r]	668,710
Gold	kilograms	--	--	--	27 [r]	53
Gypsum[e]	metric tons	4,000	4,000	4,000	-- [r, 3]	-- [3]
Salt	do.	2,889	1,821	1,005	827	--

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through November 8, 2006.

[2] Exports.

[3] Reported figure.

TABLE 2
SIERRA LEONE: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Bauxite[1]		Sierra Mineral Holdings I Ltd. (Titanium Resources Group Ltd.)	Mokanji Mine (scheduled to reopen in 2006)	1,200
Cement		Sierra Leone Cement Corp. Ltd.	Freetown plant	NA
Diamond	carats	Koidu Holdings S.A. (Energem Resources Inc. 40%, and BSG Resources Ltd., 25%)	Two kimberlite pipes, Koidu	120
Titanium, rutile concentrate[1]		Sierra Rutile Ltd. (Titanium Field Resources Ltd. and U.S. Titanium, LLC)	Sierra Rutile Mine (to reopen in 2006)	200

NA Not available.

[1] Not operating in 2005.

THE MINERAL INDUSTRY OF SOMALIA

By Thomas R. Yager

Somalia is an East African country located on the Gulf of Aden and the Indian Ocean that produced small quantities of gemstones and salt. The country also had deposits of feldspar, gypsum, iron ore, kaolin, limestone, natural gas, quartz, silica sand, tantalum, tin, and uranium. The mineral industry made a small contribution to Somalia's exports and economy in general.

Officially reported mineral and trade data continued to be unavailable because of the lack of a functioning central Government since 1991 and the conflict that pervaded most of Somalia. Somaliland (a region in northern Somalia) declared its independence in 1991, and Puntland (which is located to the east of Somaliland) declared autonomy in 1998 (United Nations Integrated Regional Information Networks, 2004). Neither of the declarations of independence were internationally recognized. Somalia's civil war has had considerable adverse consequences for the economy, which included the minerals sector. The war forced the closure of Somalia's cement plant and oil refinery and halted most exploration for mineral resources.

In 2005, the Transitional Federal Government (TFG) relocated to Somalia, but factional disputes prevented agreement upon the location of the seat of the Government. Sporadic conflict continued in some areas in 2005, including at Beletweyne, Galgadud, Gedo, and Mogadishu (United Nations Integrated Regional Information Networks, 2006).

Small amounts of salt were produced in coastal areas by solar evaporation methods. The Indian Ocean tsunami of December 26, 2004, disrupted salt production in Hurdiye in late 2004 and early 2005 (United Nations World Food Program, 2005).

Such gemstones as aquamarine, emerald, garnet, opal, red spinel, ruby, sapphire, and tourmaline were produced in Somaliland on a limited scale. Garnet and opal accounted for the largest shares of gemstone production.

In October 2005, Range Resources Ltd. of Australia announced that it had signed an agreement with the governing authority of Puntland that would give the company a majority interest in the rights to all mineral and mineral fuel exploration in Puntland. The TFG subsequently declared the agreement to be invalid on the grounds that only the national Government had the authority to negotiate mineral rights (Blackburn, 2005).

The outlook for Somalia's mineral industry is for little change in the short run. Barriers to development included continuing civil unrest, weak infrastructure, and a domestic market limited by severe poverty.

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THE MINERAL INDUSTRY OF SOUTH AFRICA

By Thomas R. Yager

The Republic of South Africa remained one of the world's leading mining and mineral-processing countries. South Africa was the world's leading producer of andalusite, chromite, ferrochrome, gold, platinum-group metals (PGM), vanadium, and vermiculite. The country was also the world's third-ranked producer of rough diamond by value and the fifth-ranked producer of rough diamond by volume (Damarupurshad, 2006; Masetlana, 2006; George, 2007a, b; Magyar, 2007; Potter, 2007a, b).

In 2005, South Africa's nominal gross domestic product (GDP) based on purchasing power parity amounted to about $570 billion; the per capita GDP was about $12,200. The real GDP grew by 4.9% compared with a revised 4.5% in 2004. The mining industry accounted for 7% of the GDP in 2005; crude and processed mineral products accounted for more than 37% of total exports. About 71% of crude mineral products and 75% of processed mineral products by value were exported in 2005 (Mwape and others, 2006, p. 10, 18; International Monetary Fund, 2006§[1]).

Government Policies and Programs

The Government's Black Economic Empowerment program required that black ownership of the mining industry reach 15% by 2009 and 26% by 2014. Recent actions to increase black ownership included the acquisition of 20% of Gold Fields Ltd. by black-owned Mvelaphanda Resources Ltd. by 2009, the transfer of mines held by AngloGold Ashanti Ltd. to black-owned African Rainbow Minerals Ltd., and the acquisition of 30% of Sallies Ltd. by African Renaissance Investments (Pty.) Ltd. (Mining Journal, 2005).

Commodity Review

Metals

Aluminum.—South Africa produced primary refined aluminum from imported alumina. National aluminum production decreased to 851,000 metric tons (t) in 2005 from 863,000 t in 2004. BHP Billiton plc operated the Bayside and the Hillside primary aluminum smelters at Richards Bay. In 2005, production at the Hillside smelter increased to 690,000 t from 680,000 t in 2004. Production at the Bayside smelter declined to 161,000 t from 183,000 t because of a potline freeze. Exports of aluminum amounted to $1.03 billion in 2005 (BHP Billiton Group, 2005, p. 2; 2006, p. 2; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Chromium.—In 2005, South Africa accounted for nearly 39% of the world's chromite production. National output of chromite decreased to 7.49 million metric tons (Mt) in 2005 from 7.68 Mt in 2004. In 2005, South Africa's exports of chromite amounted to $69.5 million. In 2004 and 2005, about 84% of the country's chromite output was sold domestically, most of which was consumed by ferrochromium producers (Masetlana, 2006; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Xstrata plc of Switzerland and its joint-venture partners operated the Boshoek, the Chrome Eden, the Horizon, the Kroondal, the Thorncliffe, and the Waterval Mines, which had a total capacity of 5.02 million metric tons per year (Mt/yr) of chromite. At the Kroondal Mines, production decreased to 1.86 Mt in 2005 from 2.13 Mt in 2004; at the Boshoek Mine, to 34,000 t from 253,000 t; and at the Horizon Mine, to 52,000 t from 131,000 t. The Chrome Eden Mine was shut down in 2005. Output at the Waterval Mine amounted to 445,000 t in 2005 (Xstrata plc, 2006, p. 79).

Samancor Chrome Ltd. [a joint venture between BHP Billiton Group (60%) and Anglo American plc (40%)] operated the Eastern Chrome Mines in Mpumalanga Province, which produced about 1.7 Mt/yr of chromite, and the Western Chrome Mines in North West Province, which produced about 1.3 Mt/yr. About 2.3 Mt/yr of the company's output was consumed in its ferrochromium plants. Samancor planned to increase chromite production to 3.61 Mt in 2006 and 9.85 Mt in 2015 because of expected increases in international stainless steel demand. In early 2005, Samancor's chromite and ferrochromium operations were sold to Kermas Group Ltd. (Metal Bulletin, 2005b; Samancor Ltd., undated§).

Assmang Ltd. of South Africa operated the Dwarsrivier Mine in Mpumalanga. In fiscal year[2] 2004-05, production at Dwarsrivier declined to 568,000 t from 648,000 t in fiscal year 2003-04. Resources at Dwarsrivier amounted to 88.3 Mt at a grade of 39.2% Cr_2O_3, of which 31 Mt was reserves at a grade of 39.6% Cr_2O_3 (Assmang Ltd., 2004; African Rainbow Minerals Ltd., 2005, p. 40; 2006, p. 37, 39).

In December 2005, Assmang completed construction of an underground mine at Dwarsrivier to replace the open pit mine. The new mine had a capacity of 1.2 Mt/yr of run of mine ore; Assmang planned to increase capacity to 1.5 Mt/yr of run of mine ore (1.1 Mt/yr of salable ore) by 2009 (African Rainbow Minerals Ltd., 2006, p. 30, 39).

South Africa was also the world's leading producer of ferrochromium in 2005, accounting for nearly 41% of global output. National production of ferrochromium declined to nearly 2.81 Mt in 2005 from a revised 3.03 Mt in 2004. Exports of ferrochromium amounted to nearly $1.56 billion in 2005 (Masetlana, 2006; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Fiscal years run from the end of June in one year through the end of June in the following year unless otherwise specified.

Xstrata and its joint-venture partner Merafe Resources Ltd. of South Africa operated the Boshoek, the Gemini, the Lydenburg, the Rustenburg, and the Wonderkop ferrochromium plants. These plants had a total combined capacity of 1.62 Mt/yr. Production decreased at Rustenburg to 383,000 t in 2005 from 393,000 t in 2004; at Lydenburg, to 374,000 t from 393,000 t; at Boshoek, to 196,000 t from 218,000 t; and at Gemini, to 4,000 t from 173,000 t. At Wonderkop, output increased to 333,000 t from 311,000 t. Xstrata's production of ferrochromium declined because of lower world stainless steel production; the company shut down furnaces at several plants in 2005 (Xstrata plc, 2006, p. 37-38, 79).

In December 2004, Xstrata and Merafe started construction on Project Lion, which was a new ferrochromium smelter with a capacity of 360,000 metric tons per year (t/yr). Xstrata planned to start production in the third quarter of 2006. Chromite was expected to be supplied by an expansion of the Thorncliffe Mine. Merafe's share in the project was expected to be 20.5% (Xstrata plc, 2006, p. 9, 38, 40).

Samancor operated the Ferrometals plant in Witbank, the Middleburg Ferrochrome plant in Middleburg, and the Tubatse Ferrochrome Plant in Steelpoort. In 2004, the company's production of ferrochromium amounted to nearly 1.07 Mt; output was reduced by 60,000 t in the third quarter of 2005 because of low ferrochromium prices. Samancor planned to increase output to 1.12 Mt in 2006 and 2.81 Mt in 2015. Initial increases in production were likely to result from expansions of existing facilities; Samancor also planned to build a new ferrochromium plant with a capacity of 1.5 Mt/yr adjacent to the Eastern Chromite Mines (BHP Billiton Group, 2005, p. 4; Magnowski, 2005; Metal Bulletin, 2005a, b).

Hernic Ferrochrome (Pty.) Ltd. (a subsidiary of Mitsubishi Corp.) completed the capacity expansion of its ferrochromium plant to 420,000 t/yr from 260,000 t/yr in October. The company had mined chromite at the Maroelabult open pit mine from 1996 to 2000; a new underground mine at Maroelabult was under construction in 2005. The new mine was expected to be completed in 2006 and to have a capacity of 1 Mt/yr (Mmakau Mining (Pty.) Ltd., 2005; Hernic Ferrochrome (Pty.) Ltd., undated§).

Assmang Ltd. operated the Machadodorp plant in Mpumalanga Province with a capacity of 290,000 t/yr. In fiscal year 2004-05, output increased to 266,000 t from 263,000 t in fiscal year 2003-04 (Assmang Ltd., 2004; African Rainbow Minerals Ltd., 2006, p. 39).

In July, Tata Steel Ltd. of India announced plans to proceed with the construction of a new ferrochromium plant at Richards Bay. The plant was expected to have a capacity of 120,000 t/yr. Tata planned to export most of the plant's output to stainless steel producers in Western Europe, the Republic of Korea, and Taiwan (Swindells, 2005).

In late 2005, International Ferro Metals Ltd. (IFM) started construction of its new chromite mine and ferrochromium plant in North West Province. The plant was expected to be completed in 18 months and to reach its full capacity of 267,400 t/yr in 2007. Jiuquan Iron and Steel Company of China signed an agreement with IFM to purchase nearly one-half of the plant's production. Resources at the mine were estimated to be 45.9 Mt at a grade of 35.6% Cr_2O_3, of which 13.02 Mt at a grade of 30.3% Cr_2O_3 was reserves. The project was expected to cost about $170 million (Metal Bulletin, 2005a; Mining Magazine, 2006).

Columbium (Niobium) and Tantalum.—Titan Processors (Pty.) Ltd. (a subsidiary of Pinnacle Resources Inc. of the United States) operated Africa's only tantalum refinery in Johannesburg. In July 2004, Titan announced plans to complete its capacity expansion and to increase production to 30 metric tons per month (t/mo) of high-purity Ta_2O_5 from 2 t/mo by the end of May 2005. The company planned to source ore supplies from independent miners in Mozambique and Zimbabwe. By the end of 2005, Titan had not commenced large-scale production (Pinnacle Resources Inc., 2004; Magyar, 2006, p. 20.5).

Copper.—In 2005, South Africa's mine production of copper increased to 103,856 t from 102,574 t in 2004. Higher production from the Palabora Mine more than offset lower production from the Black Mountain Mine and the shutdown of the Maranda copper-zinc mine in 2004. Copper smelter production increased to an estimated 110,000 t from 89,300 t, and refined copper production, to an estimated 100,000 t from 91,498 t. Copper exports amounted to $103 million in 2005 (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Rio Tinto plc operated the Palabora copper mine, smelter, and refinery. In 2005, mine production at Palabora was 65,892 t of copper from 9.54 Mt of ore milled compared with 50,915 t of copper from 8.55 Mt of ore milled in 2004. Rio Tinto planned to increase ore mined by 9%. The production of smelted copper at Palabora increased to 84,926 t in 2005 from 67,179 t in 2004, and the production of refined copper, to 80,319 t from 67,545 t. The refinery operated well below its capacity of 130,000 t/yr; most of the output was used by Rio Tinto in the production of copper rods (Palabora Mining Company Ltd., 2006, p. 10-11, 76-77).

Anglo American Platinum Corp. produced 11,300 t of refined copper at Rustenburg Base Metal Refiners in 2005 compared with 12,900 t in 2004. About 10,500 t was attributable to Anglo Platinum's PGM mining operations in 2005 compared with 12,200 t in 2004; the remainder was attributable to purchased concentrates (Anglo American Platinum Corp., 2006, p. 86).

Gold.—South Africa was the world's leading producer of gold in 2005, accounting for about 12% of world production. However, the long-term decline in the country's gold output continued in 2005, with national gold production decreasing to 294,671 kilograms (kg) from 337,223 kg in 2004 and 394,800 kg in 2001. In 2005, gold exports amounted to $3.8 billion (George, 2007a; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

AngloGold Ashanti Ltd. operated the Great Noligwa, the Kopanang, the Moab Khotsong, and the Tau Lekoa Mines in the West Wits area near Carletonville; and the Mponeng, the Savuka, and the Tau Tona Mines in the Vaal River area near Klerksdorp. AngloGold Ashanti's gold production declined to 83,200 kg in 2005 from 88,900 kg in 2004. The Ergo Mine southeast of Johannesburg, which was not included in these figures, was shut down in 2005. Total cash costs rose to

$291 per troy ounce of gold from $284 per troy ounce of gold; this increase was attributable to decreased gold production (AngloGold Ashanti Ltd., 2006, p. 45-46).

At the Mponeng Mine, production increased to 15,900 kg in 2005 from 13,600 kg in 2004 because of higher ore grades. At the Tau Tona Mine, lower ore grades and difficult mining conditions led to a decrease in production to 15,600 kg from 17,700 kg. Output declined to 3,900 kg from 4,900 kg at Savuka as the mine approached the end of its life. Cash costs at Savuka were $430 per troy ounce of gold in 2005. In 2006, production at the Mponeng Mine was expected to be between 15,400 and 16,000 kg, and at Tau Tona, between 15,300 and 15,900 kg. AngloGold Ashanti planned to shut down the Savuka Mine in March 2006 after producing about 450 kg of gold (AngloGold Ashanti Ltd., 2006, p. 47-49).

In 2005, production at the Great Noligwa Mine declined to 21,600 kg from 24,700 kg in 2004 because of lower ore grades. At the Tau Lekoa Mine, production decreased to 8,200 kg from 9,100 kg because of lower volumes mined. At the Kopanang Mine, output remained nearly unchanged at 15,000 kg. In 2006, production at Great Noligwa was expected to decline to between 20,200 and 21,100 kg; Kopanang, between 14,200 and 14,800 kg; and Tau Lekoa, between 6,400 and 6,700 kg (AngloGold Ashanti Ltd., 2006, p. 50-52).

The Moab Khotsong Mine produced more than 900 kg of gold in 2004. AngloGold Ashanti planned to produce about 1,500 kg at Moab Khotsong in 2006 and to increase output to 15,400 kg by 2012. The mine was expected to produce 112,000 kg of gold from 10 Mt of milled ore during its 15-year life. Capital costs were likely to be $659 million, of which $629 million was spent before the end of 2005 (AngloGold Ashanti Ltd., 2006, p. 51).

Harmony Gold Mining Company Ltd. of South Africa mined gold at numerous mines that included the Elandsrand, the Evander, the Kalgold, the Orkney/Welkom, and the Randfontein. The company's production of gold was 72,427 kg in 2005 compared with 89,598 kg in 2004. Harmony closed shafts at some underground mining operations because of the strength of the South African rand. Cash operating costs declined to $397 per troy ounce of gold in the fourth quarter of 2005 from $409 per troy ounce of gold in the same period in 2004. Harmony planned to increase its gold production to more than 93,000 kilograms per year (kg/yr) by 2010 (Harmony Gold Mining Company Ltd., 2004, p. 31; 2005a, p. 33; 2005b, p. 32, 39; 2005c, p. 56; 2006, p. 30, 37).

Gold Fields Ltd. of South Africa produced gold at the Beatrix, the Driefontein, and the Kloof Mines. In 2005, the company's production of gold was 83,105 kg from 14.4 Mt of ore milled compared with 87,744 kg from 16.4 Mt of ore milled in 2004. In the second half of 2005, the ore grade was 6.1 g/t gold compared with 5.6 g/t gold in the second half of 2004. Production at the Driefontein Mine declined to 34,490 kg in 2005 from 35,804 kg in 2004; at the Kloof Mine, to 29,636 kg from 32,884 kg, and at the Beatrix Mine, to 18,979 kg from 19,054 kg. Gold Fields planned to maintain production at Driefontein of 31,000 kg/yr; Kloof, 31,000 kg/yr; and Beatrix, nearly 19,000 kg/yr. At these rates of production, the life of the Kloof Mine was estimated to be 9 years; Driefontein, 8 years; and Beatrix, 5 years (Gold Fields Ltd., 2004, p. 13; 2005a, p. 17; 2005b, p. 2, 13; 2006, p. 17).

In 2005, gold production by Durban Roodepoort Deep Ltd. (DRD) of South Africa declined to 14,375 kg from 23,170 kg in 2004. Output at the North West Mines declined to 1,480 kg from 9,993 kg, and at the Blyvooruitzicht Mine, to 5,120 kg from 5,866 kg. The North West Mines were shut down in the first quarter of 2005 because of an earthquake and subsequently were sold to Simmer and Jack Mines Ltd. In the second half of 2005, cash operating costs at Blyvooruitzicht's underground operations were $419 per troy ounce of gold compared with $488 per troy ounce of gold in the same period in 2004. Production at the Crown and the East Rand Proprietary Mine joint ventures increased to 7,775 kg in 2005 from 7,311 kg in 2004. In December 2005, DRD purchased the interests of its joint-venture partners in the Crown Mine and the East Rand Proprietary Mine (Durban Roodepoort Deep Ltd., 2005, 2006).

Placer Dome Inc. produced gold at the South Deep Mine. In 2005, output was 14,342 kg from 1.04 Mt of ore milled compared with 13,330 kg from 1.1 Mt of ore milled in 2004. Cash costs decreased to $387 per troy ounce of gold in 2005 from $394 per troy ounce of gold in 2004. Reserves amounted to 110 Mt at a grade of 7.3 g/t gold. In December, Placer Dome's board of directors approved a bid by Barrick to purchase the company (Placer Dome Gold Inc., 2006, p. 2, 4, 18).

Thistle Mining Inc. of South Africa operated the President Steyn Mine in Free State. The company produced 5,430 kg of gold from 1 Mt of ore milled in 2005 compared with 5,169 kg from 1.15 Mt of ore milled in 2004. Cash costs decreased to $521 per troy ounce of gold in 2005 from $566 per troy ounce of gold in 2004. Thistle planned to produce about 5,000 kg of gold in 2006 and to maintain a long-term production rate of more than 5,400 kg/yr (Thistle Mining Inc., 2006, p. 16-17).

Anglo Platinum's production of refined gold from Rustenburg Base Metal Refiners increased to 3,655 kg in 2005 from 3,418 kg in 2004. Of this amount, 3,359 kg was attributable to Anglo Platinum's PGM mining operations in 2005 compared with 3,241 kg in 2004; the remainder was attributable to purchased concentrates (Anglo American Platinum Corp., 2006, p. 86).

Aflease Gold Ltd. started production at the Bonanza South Mine; the company planned to produce about 900 kg/yr of gold during the 4- to 5-year life of the mine. In 2007, Aflease planned to start production of gold and uranium at the Dominion uranium mine; gold production was expected to be 2,800 kg/yr. The Dominion Mine was expected to reach full production in 2010 (Mining Review Africa, 2005b).

Rand Refinery Ltd. in Germiston (AngloGold Ashanti, 53%; Gold Fields, 33%; DRD, 10%; Avgold Ltd., 2%; and Western Areas Ltd., 2%) produced 390,000 kg of refined gold in 2005, which was nearly 33% of the company's capacity. In 2004, domestic gold mines accounted for about 64% of the refinery's output; imports (mostly sourced from West Africa), 33%; and gold scrap from the domestic jewelry industry, 3%. Harmony also operated a gold refinery (Mining Review Africa, 2004; Seccombe, 2006§).

Iron Ore.—Assmang, Highveld Steel and Vanadium Corp. Ltd. of South Africa, and Kumba Resources Ltd. of South Africa mined iron ore. South Africa accounted for 3% of world iron ore production in 2004. National production of iron ore increased to 39.5 Mt in 2005 from 39.3 Mt in 2004. Iron ore exports amounted to $982 million in 2005 (Jorgenson, 2006, p. 40.25; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Kumba operated the Sishen Mine in Northern Cape Province and the Thabazimbi Mine in Limpopo Province. In 2005, output from the Sishen Mine increased to nearly 28.5 Mt from 27.6 Mt in 2004, and the Thabazimbi Mine, to 2.53 Mt from 2.5 Mt (Kumba Resources Ltd., 2006, p. 33-34).

Kumba's exports of iron ore amounted to 22.1 Mt in 2005 compared with 20.9 Mt in 2004. The increase in the company's exports was partially attributable to the increase in Chinese steel production in 2005. China accounted for 39% of Kumba's iron ore export revenues; Japan, 22%; the United Kingdom, 12%; Austria, 11%; and Germany, 10%. Kumba accounted for 4% of the world's seaborne iron ore trade (Kumba Resources Ltd., 2006, p. 34).

Domestic sales declined to 9.17 Mt in 2005 from 9.37 Mt in 2004. Mittal Steel South Africa Ltd. accounted for a majority of Kumba's domestic sales; the company had a contract with Kumba to purchase 6.25 Mt/yr of iron ore and the entire output of the Thabazimbi Mine (Kumba Resources Ltd., 2006, p. 34).

In February, Kumba decided to proceed with the expansion of the Sishen Mine. The expansion was likely to increase salable iron ore production by 10 Mt/yr; the increase would be at least partially attributable to improved beneficiation technology. Kumba planned to start production in mid-2007 and to reach full capacity by the beginning of 2009. The cost of the expansion was expected to be about $570 million. The company was conducting a feasibility study on the expansion of the Sishen Mine by an additional 10 to 20 Mt/yr. Kumba planned to complete the study in 2007; production could start in 2011 if the study was to yield favorable results. Resources at Sishen were estimated to be 2.46 billion metric tons (Gt) at a grade of 58.6% iron (Kumba Resources Ltd., 2006, p. 44, 48).

Kumba also planned to develop the Sishen South project, which is located 90 km south of the Sishen Mine. In the first phase of the project, Sishen South was expected to produce 3 Mt/yr of iron ore; output could increase to 9 Mt/yr in the second phase. The capital cost of the first phase was expected to be about $160 million. Resources at Sishen South were estimated to be 290 Mt at a grade of 64.6% iron (Kumba Resources Ltd., 2006, p. 44, 48).

Kumba was also conducting a feasibility study on the Phoenix project at the Thabazimbi Mine, which would produce between 2.5 and 3 Mt/yr of iron ore and extend the life of the mine by 20 years. The decision on the project could be made in 2006; production could start in 2009. Resources at Thabazimbi were estimated to be 61.3 Mt at a grade of 61.3% iron (Kumba Resources Ltd., 2006, p. 44, 48).

Assmang produced iron ore at the Beeshoek Mine in Northern Cape, which had a rated capacity of 6 Mt/yr. In fiscal year 2004-05, production at Beeshoek increased to 6.43 Mt from 6.26 Mt in fiscal year 2003-04. Resources at Beeshok amounted to 153 Mt at a grade of 63.6% iron, of which 73 Mt was reserves at a grade of 64.8% iron (Assmang Ltd., 2004; African Rainbow Minerals Ltd., 2006, p. 30, 32).

Assmang was considering the development of the iron ore resources at the Bruce, King, and Mokaning properties (BKM). If the company decided to proceed with the development of BKM, a new mine was expected to be completed in fiscal year 2007-08 at a cost of $446 million. Exports from the Beeshok Mine were expected to decline to less than 1 Mt/yr by fiscal year 2008-09. Assmang's total iron ore exports were likely to be about 9 Mt in fiscal years 2007-08 and 2008-09. The company was also considering an expansion of BKM's capacity to 16.8 Mt/yr from 8.4 Mt/yr in fiscal year 2009-10 at a cost of $223 million. Resources at BKM were estimated to be 672 Mt at a grade of 64.5%, of which 445 Mt was reserves at a grade of 64.7% (African Rainbow Minerals Ltd., 2005, p. 39; 2006, p. 30-31, 33-34).

Highveld mined titaniferous magnetite at its Mapochs open pit mine near Roossenekal in Mpumalanga Province. Mapochs had a capacity of 2.45 Mt/yr; average ore grades from the mine were 54.3% iron (Department of Minerals and Energy, 2004, p. 10).

Iron and Steel.—National production of crude steel was nearly unchanged in 2005 at 9.49 Mt. The production of pig iron increased to 6.13 Mt in 2005 from 6.01 Mt in 2004, and the production of direct-reduced iron (DRI) rose to 1.78 Mt from 1.63 Mt. South Africa's share of African pig iron output amounted to 74%; crude steel, 53%; and DRI, 28% (International Iron and Steel Institute, 2006, p. 3, 5, 11).

Mittal Steel South Africa accounted for most of South Africa's production of crude steel at its Newcastle, Saldanha, Vanderbijlpark, and Vereeniging plants. The production of liquid steel at Vanderbijlpark increased to 3.82 Mt in 2005 from 3.63 Mt in 2004 in spite of a blast furnace shutdown for repairs. At Saldanha, production increased to 1.24 Mt in 2005 from 1.23 Mt in 2004, and at Newcastle and Vereeniging, to 2.19 Mt from 2.18 Mt (Mittal Steel South Africa Ltd., 2006, p. 15).

Mittal planned to increase liquid steel production at Vanderbijlpark by about 1.9 Mt/yr by the end of 2009 and 2.3 Mt/yr by 2012. By the second half of 2006, the company planned to increase production at Vanderbijlpark by 445,000 t/yr by relining blast furnace D, and to gain an additional 660,000 t/yr from increased efficiency. The installation of new DRI kilns was expected to increase output by 325,000 t/yr by the second half of 2007 and by 830,000 t/yr by the second half of 2009. By 2012, Mittal planned to increase production by 355,000 t/yr by relining blast furnace C. The cost of the expansion at Vanderbijlpark was estimated to be about $700 million from 2006 to 2009. The company also planned to increase capacity at Saldanha and Vereeniging by 105,000 t/yr (Mittal Steel South Africa Ltd., 2005, p. 5, 7).

Mittal's production of rolled steel products at Vanderbijlpark was nearly 4 Mt; Newcastle and Vereeniging, about 2 Mt; and Saldanha, about 1.2 Mt/yr. Vanderbijlpark produced a wide range of flat products that included steel coils and plates, and hot-rolled, cold-rolled, galvanized, tinplated, and color-coated sheets. Saldanha produced mainly hot-rolled coil, and Newcastle and Vereeniging, long steel products. Mittal supplied about 80% of South Africa's demand for flat steel products; the company was Africa's leading flat steel producer.

Highveld operated a rolling mill at Witbank. In 2005, the company's production of rolled steel products was 683,969 t compared with 674,013 t in 2004 and 653,723 t in 2001. Scaw Metals (a subsidiary of Anglo American plc) decreased production of rolled products at its Germiston plant to 386,500 t in 2005 from 458,000 t in 2004 (Anglo American plc, 2006, p. 121; Highveld Steel and Vanadium Corp. Ltd., 2006).

Columbus Stainless (Pty.) Ltd. operated South Africa's only stainless steel plant at Middleburg. Production amounted to 658,000 t in 2005 compared with 718,000 t in 2004 and 643,000 t in 2003. Columbus accounted for nearly 3% of the world's stainless steel output in 2005 (Ferro-alloys Monthly, 2006).

Lead and Zinc.—South Africa's mine production of zinc was nearly unchanged at 32,112 t in 2005. Increased production from the Black Mountain Mine was offset by the shutdown of the Maranda copper-zinc mine in the third quarter of 2004. Lead mine production increased to more than 42,000 t in 2005 from about 37,500 t in 2004.

Anglo American plc operated the Black Mountain lead-zinc-copper mine near Aggeneys in Northern Cape Province. In 2005, production at Black Mountain amounted to 32,100 t of zinc and 42,200 t of lead from 1.35 Mt of ore milled compared with 28,200 t of zinc and nearly 37,500 t of lead from 1.5 Mt of ore milled in 2004. The development of the Deeps Mine at Black Mountain was completed in 2005 (Anglo American plc, 2006, p. 9-10, 120).

Zinc Corp. of South Africa Ltd. (a subsidiary of Kumba Resources Ltd.) operated South Africa's only zinc refinery at Springs. In 2005, production declined to 102,000 t from 104,000 t in 2004 because of lower-quality concentrates from the refinery's main suppliers (Kumba Resources Ltd., 2006, p. 40).

Manganese.—In 2005, South Africa's mine production of manganese ore increased to 4.61 Mt from 4.28 Mt in 2004. Manganese ore exports amounted to $239 million in 2005 (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Samancor operated the Mamatwan open pit mine and the Wessels underground mine near Hotazel in the Northern Cape Province. In 2005, Samancor's production of manganese ore decreased to 2.33 Mt from 2.52 Mt in 2004 (BHP Billiton Group, 2005, p. 3; 2006, p. 3).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. Capacity at Nchwaning was 3 Mt/yr, and at Gloria, 600,000 t/yr. In fiscal year 2004-05, production at the mines increased to 1.81 Mt from 1.41 Mt in fiscal year 2003-04. Resources at the mines were 631 Mt at a grade of 39.9% manganese, of which 189 Mt was reserves at a grade of 42.4% manganese. Ore grades at the Nchwaning Mine ranged from 38.9% to 49.1% manganese; and at the Gloria Mine, from 31.9% to 38.3% manganese (Assmang Ltd., 2004; African Rainbow Minerals Ltd., 2005, p. 36-37; 2006, p. 30, 35-36).

Domestic production of manganese metal, alloys, and compounds declined to about 846,000 t in 2005 from 970,000 t in 2004. South Africa's exports of manganese metal and manganese alloys amounted to $439 million in 2005 (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Samancor produced ferromanganese and silicomanganese at its plant at Meyerton. The company's production of manganese alloys was 419,000 t in 2005 compared with 504,000 t in 2004. Assmang produced ferromanganese at the Cato Ridge plant in Kwa-Zulu Natal, which had a capacity of 300,000 t/yr. In fiscal year 2004-05, production at Cato Ridge decreased to 197,000 t from 238,000 t in fiscal year 2003-04. Assmang was considering an increase in Cato Ridge's capacity to 380,000 t/yr. Highveld's silicomanganese production was 104,409 t in 2005 compared with 137,606 t in 2004 (Assmang Ltd., 2004; BHP Billiton Group, 2005, p. 3; 2006, p. 3; African Rainbow Minerals Ltd., 2006, p. 35-36; Highveld Steel and Vanadium Corp. Ltd., 2006).

Nickel.—Most of South Africa's nickel mine production was a coproduct of PGM mining. In 2005, national nickel mine production declined to 39,853 t from 40,842 t in 2004. Domestic nickel consumption amounted to about 25,000 t in 2004.

Anglo Platinum produced 20,500 t of refined nickel at Rustenburg Base Metal Refiners in 2005 compared with 22,300 t in 2004 and 19,500 t in 2000. About 19,000 t was attributable to Anglo Platinum's PGM mining operations compared with 21,200 t in 2004 and 19,500 t in 2001 (Anglo American Platinum Corp., 2006, p. 86).

In fiscal year 2004-05, Impala Platinum Holdings Ltd. (Implats) produced 8,100 t of refined nickel from its refinery northeast of Johannesburg compared with 9,500 t in fiscal year 2003-04. Production at this plant was from purchased concentrates and toll refining. Implats also produced nickel from its Impala PGM mines near Rustenburg in North West Province; production of refined nickel from Impala increased to 7,900 t in fiscal year 2004-05 from 6,900 t in fiscal year 2003-04. Implats produced small amounts of nickel from the Marula PGM mine (Impala Platinum Holdings Ltd., 2005, p. 57, 77).

African Rainbow Minerals Ltd. of South Africa operated the Nkomati nickel mine. Output at Nkomati was about 5,000 t/yr of nickel. The company planned to increase production to 21,500 t/yr of nickel by fiscal year 2009-10. Resources at Nkomati were estimated to be 144 Mt at a grade of 0.46% nickel, of which 67 Mt was reserves at a grade of 0.5% nickel. The life of the mine was expected to be 20 years (African Rainbow Minerals Ltd., 2005, p. 42; 2006, p. 18).

Platinum-Group Metals.—South Africa was the world's leading producer of PGM in 2005. The country's share of world platinum production was 78%, and palladium, 39%. South Africa's production of PGM increased to 302,981 kg in 2005 from 276,401 kg in 2004. In 2005, national exports of platinum amounted to $3.82 billion; rhodium, $580 million; palladium, $284 million; and ruthenium, $53.9 million (George, 2007b; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

In 2005, Anglo Platinum produced 144,700 kg of refined PGM compared with 137,700 kg in 2004. About 131,600 kg was attributable to the company's mining operations in 2005 compared with 130,100 kg in 2004. Platinum produced from Anglo's mining operations amounted to 69,600 kg; palladium, 38,000 kg; and rhodium, 9,300 kg (Anglo American Platinum Corp., 2006, p. 96).

At the Rustenburg Section, platinum production decreased to 25,600 kg in 2005 from 26,900 kg in 2004 in spite of higher output from the UG2 project. (UG2 is a chromite and PGM-rich layer in the Eastern Bushveld.) Anglo Platinum planned to increase platinum output at Rustenburg to between 26,400 and

28,000 kg/yr starting in 2008. Production at the Amandelbult Section declined to 17,100 kg of platinum from 18,800 kg because of difficult geologic conditions. Output was expected to increase in 2006. At the Union Section, platinum production declined to 9,645 kg from 9,941 kg. Production declined slightly at the Lebowa Platinum Mine and increased slightly at the Bafokeng-Raismone and the Potgietersrust Platinums Mines. In 2006, platinum output at the Bafokeng-Raismone Mine was expected to be about 6,200 kg (Anglo American Platinum Corp., 2006, p. 16-17, 46, 48, 52, 99-104).

At the Modikwa Mine (a joint venture with African Rainbow Minerals), production of PGM increased to 10,211 kg in 2005 from 8,603 kg in 2004; platinum production rose to 3,987 kg from 3,546 kg in 2004. Higher production was attributable to an increase in ore milled. By mid-2007, Modikwa was expected to reach its full planned production of 10,800 kg/yr of PGM (African Rainbow Minerals Ltd., 2006, p. 18; Anglo American Platinum Corp., 2006, p. 107).

In 2005, production at the Kroondal Mine (a joint venture with Aquarius Platinum Ltd. of South Africa) increased to 13,009 kg of PGM from 8,014 kg in 2004; platinum production increased to 7,782 kg from 4,823 kg. Higher production was attributable to a new concentrator that was commissioned in March 2005. Anglo Platinum and Aquarius planned to increase Kroondal's production to 15,700 kg/yr of PGM (Aquarius Platinum Ltd., 2005, p. 3-7; 2006, p. 5; Anglo American Platinum Corp., 2006, p. 54).

Anglo Platinum planned to increase its total refined platinum production to between 84,000 and 87,000 kg in 2006. Further production increases were likely in subsequent years because of the Mototolo joint-venture project with Xstrata. Anglo Platinum planned to start production at Mototolo in late 2006; output was expected to be about 4,100 kg/yr of platinum and 2,600 kg/yr of palladium (Anglo American Platinum Corp., 2006, p. 16-18).

Impala Platinum Ltd. (Implats) operated the Impala Mines near Rustenburg in North West Province and the Marula Mine in Limpopo Province. In fiscal year 2004-05, production of refined PGM at Impala was 64,132 kg compared with 61,445 kg in fiscal year 2003-04; platinum production increased to 34,668 kg from 33,912 kg. Higher output was attributable to an increase in ore milled. Implats planned to maintain production at about 34,000 kg/yr of platinum for the 30-year life of the Impala mines. The company also planned to increase the capacity of the Base Metals Refinery (which refined concentrates from the Impala Mines) to more than 62,000 kg/yr of refined platinum in September 2005 and 71,500 kg/yr by the end of June 2006 (Impala Platinum Holdings Ltd., 2005, p. 57, 61-63).

By 2010, higher PGM production in South Africa and Zimbabwe was expected to allow Implats to use its expanded capacity. Sources of additional PGM included the Marula Mine (operated by Implats), the Two Rivers Mine (operated by African Rainbow Minerals and Implats), and the Everest South and Marikana Mines (operated by Aquarius) in South Africa and the Mimosa and Zimplats Mines in Zimbabwe (Mining Review Africa, 2005a).

In fiscal year 2004-05, platinum production at Marula increased to 927 kg from 414 kg in fiscal year 2003-04. Implats planned to increase platinum production at Marula to 2,300 kg in fiscal year 2006-07 and 4,500 kg in fiscal year 2008-09. The life of the mine was expected to be 17 years (Impala Platinum Holdings Ltd., 2005, p. 64, 67).

Implats also operated a refinery northeast of Johannesburg; production at this plant was from purchased concentrates and toll refining. In fiscal year 2004-05, the refinery's production decreased to 46,245 kg of PGM from 54,409 kg in fiscal year 2003-04 because Lonmin plc completed the refurbishment of its own smelter. Implats planned to increase production in fiscal year 2005-06 (Impala Platinum Holdings Ltd., 2005, p. 76-78).

African Rainbow Minerals and Implats were engaged in a joint venture to develop the Two Rivers Mine in Mpumalanga Province. The companies planned to produce 3,700 kg/yr of platinum, 2,100 kg/yr of palladium, and 600 kg/yr of rhodium; the mine was expected to reach its full capacity in fiscal year 2007-08. The capital cost of the project was likely to be about $190 million. The reserves at Two Rivers were estimated to be 40.3 Mt at a grade of 4.18 g/t PGM and gold. African Rainbow Minerals also planned to produce 4,000 kg/yr of PGM with the expansion of the Nkomati nickel mine (African Rainbow Minerals Ltd., 2005, p. 44; 2006, p. 18; Impala Platinum Holdings Ltd., 2005, p. 75).

Lonmin plc of the United Kingdom mined PGM at the Eastern Platinum Mine, the Karee Mine, and the Western Platinum Mine, east of Rustenburg in North West Province and at the Limpopo Mine. From September 2004 to September 2005, these mines produced 28,145 kg of platinum compared with 28,514 kg in the previous 12 months. Total production of PGM increased to 52,207 kg from 52,147 kg. Ore processed declined to 13.5 Mt from 14.4 Mt. The Limpopo Mine produced 801 kg of PGM that included 358 kg of platinum (Lonmin plc, 2005, p. 26).

Lonmin planned to increase platinum production to 31,000 kg in 2006 and 40,000 kg in 2010. The Eastern Platinum, the Karee, and the Western Platinum Mines were expected to produce 34,000 kg in 2010, and the Limpopo Mine, about 6,000 kg. The expansion of the Limpopo Mine to 6,000 kg from 2,300 kg in 2007 depended upon favorable results from a feasibility study (Lonmin plc, 2005, p. 5, 12).

Aquarius operated the Marikana Mines. In 2005, production of PGM at Marikana was 3,159 kg compared with 2,583 kg in 2004; platinum production rose to 1,999 kg from 1,720 kg. Output at Marikana was expected to increase to 2,800 kg/yr of platinum and 1,300 kg/yr of palladium by the end of 2006. Aquarius completed construction on the Everest Mine in the fourth quarter of 2005; production amounted to 211 kg of PGM. The company planned to reach full production of 7,000 kg/yr of PGM in 2006. Reserves at Everest were estimated to be 26.8 Mt at a grade of 3.36 g/t PGM (Aquarius Platinum Ltd., 2005, p. 3-8; 2006, p. 2, 7, 9; Anglo American Platinum Corp., 2006, p. 17).

Silicon.—In 2005, South Africa's production of silicon metal and ferrosilicon declined to 180,494 t from 191,743 t in 2004. Silicon Smelters (Pty.) Ltd. was the only domestic producer of silicon metal. In 2005, Highveld produced 42,656 t of ferrosilicon compared with 58,155 t in 2004 from its plant at Witbank. Kumba's ferrosilicon production amounted to about 6,000 t/yr. Silicon Technology (Pty.) Ltd. also produced ferrosilicon. In 2005, exports of silicon metal and ferrosilicon amounted to $98.3 million (Highveld Steel and Vanadium Corp. Ltd., 2006; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Silver.—National silver mine production was 87,874 kg in 2005 compared with 70,913 kg in 2004 and 109,570 kg in 2001. Silver was mined as a coproduct of copper, gold, lead, PGM, nickel, and zinc. In February, Rand Refinery Ltd. announced that it had installed new equipment that increased its capacity to 200,000 kg/yr of refined silver from 120,000 kg/yr (Rand Refinery Ltd., 2005).

Tin.—In March 2005, Centurion Gold Holdings Inc. of South Africa acquired the assets of Zaaiplaats Tin Mining Ltd., which included the Zaaiplaats Mine in Limpopo Province. In November, Centurion was awarded exploration permits for the Zaaiplaats Mine; the company planned to reopen the mines immediately and produce about 2,500 t/yr of tin (Centurion Gold Holdings Inc., 2005).

Titanium and Zirconium.—BHP Billiton Group and Rio Tinto mined ilmenite, rutile, and zircon, and produced titanium slag at Richards Bay. Titanium slag capacity amounted to 1.06 Mt/yr. In 2004, zircon production declined to less than 240,000 t because of a fire at Richards Bay (Mining Magazine, 2005, 2006).

In 2005, Ticor SA (Kumba, 60%, and Ticor Ltd., 40%) produced 377,000 t of ilmenite from the Hillendale Mine in KwaZulu Natal Province compared with 459,000 t in 2004 because of lower grades. Rutile production increased to 23,000 t from 20,000 t, and zircon production declined to 47,000 t from 49,000 t. Kumba planned to start production at the Fairbreeze Mine in July 2008 because of declining grades at Hillendale. Resources at Fairbreeze were estimated to be 229 Mt at a grade of 3.6% ilmenite, and at Hillendale, 48.7 Mt at a grade of 3.8% ilmenite. Kumba also held a deposit in East Cape Province with resources of 239 Mt at a grade of 4.5% ilmenite. Development of this deposit has been delayed by environmental concerns (Kumba Resources Ltd., 2006, p. 38, 45-46; Mining Magazine, 2006).

Kumba and Ticor SA also operated the Empangeni smelter near the Hillendale Mine. In 2005, production of titanium slag increased to 164,000 t from 136,000 t in 2004. Kumba purchased Ticor Ltd.'s share in Ticor SA in December 2005 (Kumba Resources Ltd., 2006, p. 38).

Anglo American mined ilmenite, rutile, and zircon at its Namakwa Sands project on South Africa's western coast. Ilmenite production at Namakwa Sands declined to 316,100 t in 2005 from 320,600 t in 2004. Rutile production increased to 29,100 t in 2005 from 23,700 t in 2004, and zircon, to 128,600 t from 119,100 t. By 2008, Anglo American planned to complete a $43 million expansion to increase rutile and zircon output by 26% and 20%, respectively (Mining Magazine, 2006).

Vanadium.—Highveld, Xstrata, and Vametco Minerals Corp. mined vanadium from vanadiferous magnetite. South Africa was the world's leading producer of vanadium in 2005; most of the country's vanadium output was exported. Exports of vanadium products amounted to $591 million in 2005 (Magyar, 2007; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Highveld produced vanadium from titaniferous magnetite ore at the Mapochs Mine. In 2005, the company produced 8,252 t of vanadium from 66,750 t of vanadium slag compared with 8,448 t of vanadium from 67,587 t of vanadium slag in 2004. Highveld also produced 8,565 t of vanadium in ferrovanadium in 2005 compared with 8,753 t in 2004; production of vanadium pentoxide (V_2O_5) decreased to 9,618 t from 9,869 t. In April 2005, Highveld announced plans to increase its production of V_2O_5 by 30% within 18 months (Ryan's Notes, 2005b; Highveld Steel and Vanadium Corp. Ltd., 2006; Mining Magazine, 2006).

Xstrata produced V_2O_5 at Rhovan in Brits; the plant had a capacity of 10,600 t/yr of V_2O_5. The company's Vantech facility was placed on care and maintenance in early 2004 after the Kennedy's Vale deposit was depleted in December 2003. Production at Vantech was 548 t of V_2O_5 in 2004. At Rhovan, production increased to 9,146 t of V_2O_5 compared with 9,035 t in 2004. Xstrata also produced ferrovanadium at Rhovan; production declined to 4,592 t in 2005 from 5,910 t in 2004 (Xstrata plc, 2006, p. 79).

Xstrata planned to increase capacity at Rhovan by about 3,900 t/yr of V_2O_5. The company expected to complete an Environmental Management Program Report for the expansion in the first half of 2006 (Xstrata plc, 2006, p. 41).

In January 2005, Vametco reopened its mine at Brits, which had a capacity of 5,400 t/yr of V_2O_5. Vametco used vanadium slag from its mine and Highveld's mines to produce vanadium nitride, which was used in steel production (Ryan's Notes, 2005a).

Industrial Minerals

Diamond.—South Africa was the world's fifth-ranked diamond producer by volume, accounting for about 9% of world production in 2004. In 2005, national rough diamond production rose to about 15.8 million carats from 14.3 million carats in 2004. Kimberlites accounted for 14.3 million carats; alluvial deposits, 1.38 million carats; and marine deposits, 55,000 carats (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

DeBeers Group accounted for most of South Africa's rough diamond production. In 2005, the company's production of diamond was nearly 15.2 million carats from 34.7 Mt of ore milled compared with more than 13.7 million carats from 33.8 Mt of ore milled in 2004. Ore grades varied from 6.8 carats per 100 metric tons at the Koffiefontein Mine to 143.5 carats per 100 metric tons at the Venetia Mine (DeBeers Group, 2006, p. 88).

The production increase in 2005 was mostly attributable to the Venetia Mine. At Venetia, production was 8.52 million carats from 5.93 Mt of ore milled in 2005 compared with 7.19 million carats from 5.87 Mt of ore milled in 2004. At Kimberley, production was 1.9 million carats from 9.67 Mt of ore milled in 2005 compared with 2.05 million carats from 9.07 Mt of ore milled in 2004. DeBeers shut down the underground mining operation at Kimberley; the company continued production by reprocessing old tailings. The Koffiefontein Mine was shut down when DeBeers was unable to find a buyer. In 2005, the Finsch Mine produced 2.22 million carats; the Cullinan Mine, 1.3 million carats; the Namaqualand Mine, 1.01 million carats; the Koffiefontein Mine, 123,505 carats; and The Oaks Mine, 68,943 carats (DeBeers Group, 2006, p. 88; Mining Magazine, 2006).

Trans Hex Group of South Africa operated the Baken, the Bloeddrif, the Reuning, and the Saxendrift alluvial diamond mines. In fiscal year 2004-05, Trans Hex produced 137,100 carats compared with 140,300 carats in fiscal year 2003-04. Resources at the company's South African mines were estimated to be 800,000 carats, of which 700,000 carats was reserves. The Baken Mine accounted for 600,000 carats of reserves. In mid-2005, the Baken Mine was estimated to have a remaining life of at least 8 years, and the Bloeddrif Mine, 4 years (Trans Hex Group, 2005, p. 12-13, 20).

Crown Diamonds NL of Australia produced diamond from the Helam Mine in North West Province, the Sedibeng Mine in Northern Cape Province, and the Star Mine in Free State Province. The company produced 144,000 carats in fiscal year 2004-05. Crown merged with Petra Diamonds Ltd. in May. Petra planned to produce 200,000 carats from Helam, Sedibeng, and Star in fiscal year 2005-06; 265,000 carats in fiscal year 2007-08; and 320,000 carats in fiscal year 2009-10. In April, resources at Helam were estimated to be 3.15 million carats; Star, nearly 590,000 carats, and Sedibeng, about 540,000 carats (Petra Diamonds Ltd., undated).

Fluorspar.—Van den Heever Fluorspar Works, Vergenoeg Mining Corp. (Pty.) Ltd., and Witkop Fluorspar Mine (Pty.) Ltd. (a subsidiary of Sallies Ltd.) produced fluorspar. In 2005, national production of fluorspar declined to an estimated 245,000 t from 265,000 t in 2004. At the Witkop Mine, production from June 2004 to June 2005 was 39% higher than that of the previous 12 months because of an expansion completed in November 2004. In 2005, Sallies announced plans to purchase the Buffalo Fluorspar Mine, which was shut down in 2001.

Vermiculite.—South Africa was the world's leading producer of vermiculite; it accounted for about 40% of world production in 2005. In 2005, production at the Palabora Mine increased to 209,801 t from 196,893 t in 2004 (Palabora Mining Company Ltd., 2006, p. 77; Potter, 2007b).

Mineral Fuels

Coal.—In 2005, South Africa's production of coal increased to 245 Mt from 243.4 Mt in 2004. More than 99% of the country's coal output was bituminous coal. South Africa was Africa's leading producer of coal, accounting for 98% of continental production in 2004. In 2005, exports of coal amounted to $3.25 billion. South Africa accounted for about 3% of world coal consumption (British Petroleum plc, 2006, p. 35; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy, written commun., July 11, 2006).

Anglo American increased its production of coal to nearly 56.9 Mt in 2005 from 54.5 Mt in 2004. Production at Kriel increased to 12 Mt from 11.1 Mt; at Landau, to 3.68 Mt from 3.47 Mt; at Bank, to 3.2 Mt from 2.73 Mt; at Mafube, to 1.06 Mt from 321,000 t; and Nooitgedacht, to 794,400 t from 676,600 t. The Isibonelo Mine, which opened in 2005, produced 1.36 Mt. At New Vaal, output declined to 17.1 Mt from 17.3 Mt; at Goedehoop, to 6.3 Mt from 6.46 Mt; at Kleinkopje, to 4.48 Mt from 4.69 Mt; and at New Denmark, to 4.14 Mt from 4.98 Mt. Higher production at these mines was attributable to increased demand from South African utility Eskom (Anglo American plc, 2006, p. 10, 117).

Ingwe Coal Corp. Ltd. (a subsidiary of BHP Billiton Group) produced coal at the Douglas, the Khutala, the Klipspruit, the Koornfontein, the Middleburg, and the Rietspruit Mines in Mpumalanga Province. In 2005, Ingwe produced 53.8 Mt of coal compared with 55.3 Mt in 2004. The company had a joint-venture agreement with Xstrata for the Douglas and the Middleburg Mines, where production (combined) declined to 23 Mt in 2005 from 23.9 Mt in 2004. Sales to local utilities amounted to 29.9 Mt in 2005; exports amounted to 21.9 Mt; and sales to other South African customers amounted to 1.1 Mt (BHP Billiton Group, 2005, p. 12; 2006, p. 13; Xstrata plc, 2006, p. 80).

In fiscal year 2004-05, Sasol Ltd. of South Africa decreased its coal production to 47.7 Mt from 52.4 Mt in fiscal year 2003-04. At the Secunda Mining Complex, which included the Bossjesspruit, the Brandspruit, the Middelbult, the Syferfontein, and the Twistdraai Mines, output declined to 45.1 Mt from 46.2 Mt because of difficult geologic conditions at Middlebult. At the Sigma Mine, production decreased to 2.6 Mt from 6.2 Mt because the Sasolburg petrochemical plant switched from using coal to using imported natural gas from Mozambique as raw material. Sasol consumed 42.4 Mt of coal in the production of synthetic fuels and other chemicals and exported 3.6 Mt in fiscal year 2004-05 (Sasol Ltd., 2005a, p. 39-40, 42).

Sasol was engaged in a joint-venture agreement with Anglo American to develop the Kriel South coal reserves and to expand the Syferfontein Mine. Each of these projects was expected to increase coal production by 5 Mt/yr; the Kriel South project was completed in 2005. Anglo American planned to sell the output of Kriel South to Sasol for synthetic fuel production. The project was expected to cost $169 million. Sasol's coal reserves amounted to 1.46 Gt in 2005, which included 142 Mt at Bossjesspruit, 131 Mt at Syferfontein, and 121 Mt at Middlebult (Sasol Ltd., 2004, p. 32; 2005a, p. 100; 2005b).

Black-empowerment company Eyesizwe Coal (Pty.) Ltd. of South Africa produced 25 Mt/yr of coal from the Arnot, the Glisa, the Mafube, the Matla, and the New Clydesdale Mines. The company exported about 1.2 Mt/yr of coal; Europe accounted for 90% of Eyesizwe's exports, and South America, 10%. In late 2004, Eyesizwe and Anglo American started production at the Mafube Mine in Mpumalanga Province, which produced nearly 1.1 Mt/yr. The companies planned to increase production at Mafube by 5 Mt/yr at a cost of $264 million. If Eyesizwe and Anglo American were to receive regulatory approval for the expansion, the project could be completed in 2008 (Reuters Ltd., 2005; Anglo American plc, 2006, p. 9-10).

Eyesizwe and Kumba were engaged in a joint venture to build the Inyanda Coal Mine near Witbank with a capacity of 1 Mt/yr. The companies planned to start construction in the fourth quarter of 2006; production was expected to start in July 2008. The cost of the project was expected to be $29 million. The timing of the project depended upon the expansion of the Richards Bay coal terminal (Kumba Resources Ltd., 2006, p. 45).

Kumba operated the Grootegeluk and the Tshikandeni Mines in Limpopo Province and the Leeuwpan Mine in Mpumalanga Province. The company's production amounted to more than 19.8 Mt in 2005 compared with 19.4 Mt in 2004. Output increased at Grootegeluk and Leeuwpan; Grootegeluk produced 17.5 Mt in 2005. Sales to Eskom amounted to 14.7 Mt; sales to other domestic consumers, 4.2 Mt; and exports, 1.1 Mt (Kumba Resources Ltd., 2006, p. 33, 36).

Construction of a new plant with a capacity of 530,000 t/yr was started at Grootegeluk in 2005; the plant was expected to be completed in the second half of 2006 at a cost of $51 million. The capacity expansion of 1 Mt/yr was completed at Leeuwpan in the third quarter of 2005; full production was expected in the first quarter of 2006. Kumba planned to increase its production to 22 Mt in 2006 because of the expansions at Grootegeluk and Leeuwpan and higher demand from Eskom (Kumba Resources Ltd., 2006, p. 36, 45).

In March 2005, Kumba completed a prefeasibility study on the Waterburg development, which could increase production at the Grootegeluk Mine by an additional 6 Mt/yr. The company planned to complete a feasibility study by mid-2006. If the study yielded favorable results, Kumba planned to start construction in 2008 and to start production in early 2010. (Kumba Resources Ltd., 2006, p. 45).

Xstrata operated 11 coal mines at Breyten, Carolina, Ermelo, and Witbank. In 2005, the company's coal production decreased to 16.6 Mt from 17.4 Mt in 2004. Production at the Tavistock Mine rose to 2.04 Mt from 1.88 Mt because of upgrades to the beneficiation plant and mining equipment in 2003 and 2004. At the South Witbank Mine, output rose to 1.86 Mt from 1.77 Mt. At the Phoenix Mine, production declined to 1.01 Mt from 1.66 Mt. Output declined to 733,000 t from 920,000 t at the Spitzkop Mine and to 504,000 t from 814,000 t at the Waterpan Mine. Production at Waterpan declined because of the closure of the underground mining operations, and at Phoenix, because of changes in the coal grades required by Eskom (Xstrata plc, 2006, p. 52-53, 80).

In 2005, Xstrata completed a feasibility study on increasing production at the Goedgevonden Mine to between 6 and 7 Mt/yr. About 3 Mt/yr of coal was expected to be exported and between 3 and 4 Mt/yr was expected to be consumed by Eskom. Xstrata planned to commence the expansion in 2006. The company also completed a prefeasibility study on expanding the life of the Douglas and Middleburg Mines to 2033 (Xstrata plc, 2006, p. 54).

Petroleum.—South Africa produced modest amounts of crude petroleum; most of the country's output of refined petroleum products was derived from imports. In 2005, South Africa's consumption of petroleum products amounted to 529 million barrels (Mbbl) compared with 523 Mbbl in 2004 and 475 Mbbl in 2000. South Africa accounted for 19% of African petroleum products consumption and nearly 1% of world petroleum products consumption (British Petroleum plc, 2006, p. 11).

Uranium.—Anglogold Ashanti mined uranium as a coproduct of gold at its Vaal Reefs operations. In 2005, national production of uranium oxide (U_3O_8) declined to 795 t from 887 t in 2004 and 1,065 t in 2001. All South Africa's uranium output was exported; enriched uranium was imported for use in the Koeberg nuclear reactor. South Africa accounted for less than 1% of world nuclear energy consumption (British Petroleum plc, 2006, p. 36).

Aflease Gold Ltd. produced small amounts of uranium from the Bonanza South Gold Mine. The company planned to start development of the Dominion uranium mine in November. Aflease expected to produce 900 t of U_3O_8 in 2007, nearly 1,300 t in 2008, 1,600 t in 2009, and 1,800 t in 2010. Rare earth elements could also be produced at the mine. The capital cost was expected to be $112 million; the life of the Dominion Mine was likely to be more than 30 years (Mining Review Africa, 2005b).

Outlook

Capacity expansions by numerous producers are likely to lead to higher production of coal, ferrochromium, fluorspar, iron ore, manganese, nickel, PGM, steel, vanadium, and uranium for the next 5 years. These expansions depend upon the continuation of the broad-based increase in world demand for minerals. Factors that could inhibit these plans include the strength of the South African rand and the high rates of HIV infection in the mining workforce.

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS						
Aluminum metal, primary		662,497	706,916	738,000	863,000	851,000
Antimony concentrate:						
Gross weight		8,320	9,910	9,000	8,400 [e]	8,600 [e]
Sb content (58% Sb)		4,827	5,746	5,291	4,967	5,000 [e]
Chromium, gross weight:						
44% to 48% chromic oxide	thousand metric tons	2,180	2,459	2,640	2,888	2,394
Less than 44% chromic oxide	do.	3,322	3,977	4,766	4,789	5,100
Total	do.	5,502	6,436	7,406	7,677	7,494
Cobalt:						
Mine output, Co content[e]		560 [r]	520 [r]	400 [r]	460 [r]	400
Refinery output:		371	366	271	309	268
Copper:						
Mine (company output), Cu content		141,865	129,589	120,800	102,574 [r]	103,856
Metal:						
Smelter		142,500	119,667	112,025	89,300	110,000 [e]
Refined, primary		132,078	101,000	111,000	91,498	100,000 [e]
Gold, primary	kilograms	394,800	398,523	373,300	337,223 [r]	294,671
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	34,757	36,484	38,086	39,322	39,542
Fe content (62%-65%)	do.	22,240	23,200	24,200	24,800	24,900
Metal:						
Pig iron	do.	5,820	5,823	6,234	6,011	6,130
Direct-reduced iron	do.	1,556	1,702	1,542	1,633	1,781
Ferroalloys, electric arc furnace:						
Chromium ferroalloys	do.	2,141	2,351	2,813	3,032 [r]	2,812
Ferromanganese	do.	524	619	607	612	530 [e]
Ferrosilicon	do.	108	142	135	141	130 [e]
Ferrovanadium[e]	do.	18	25	27	25	25
Silicomanganese[e]	do.	220	273	301	310	270
Silicon metal	do.	39	43	49	51	50 [e]
Other	do.	64	85	80	80 [e]	80 [e]
Total[e]	do.	3,110	3,540	4,010	4,250	3,900
Steel:						
Crude	do.	8,821	9,100	9,481	9,500 [r]	9,493
Stainless		440	550	643	718	658
Lead:						
Concentrate, Pb content		50,771	49,444	39,941	37,485	42,159
Refined, secondary		53,000	60,900	64,900	64,100	64,000 [e]
Manganese:						
Ore and concentrate, gross weight:						
Metallurgical:						
More than 48% manganese	thousand metric tons	2,082	1,600	1,619	1,988	2,467
45% to 48% manganese	do.	--	728	178	372	454
40% to 45% manganese	do.	326	19	783	1,041	935
30% to 40% manganese	do.	832	955	905	864 [r]	743
Total	do.	3,240	3,302	3,485	4,265 [r]	4,599
Chemical, 35% to 65% manganese dioxide	do.	26	20	16	17	12
Grand total	do.	3,266	3,322	3,501	4,282 [r]	4,611
Metal, electrolytic[e]	do.	40	40	40	40	44 [2]
Nickel:						
Mine output, concentrate, nickel content[e]		36,443	38,546	40,842	39,851 [r]	42,392
Metal, electrolytic		30,500 [e]	31,646	40,800	39,900	42,400 [e]

See footnotes at end of table.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS--Continued						
Platinum-group metals:						
Iridium	kilograms	NA	3,682	6,444	5,769 [r]	6,280
Platinum	do.	130,307	132,897	148,348	153,239 [r]	163,711
Palladium	do.	62,601	63,758	70,946	76,403 [r]	82,961
Rhodium	do.	13,507	15,175	16,816	16,294 [r]	20,224
Ruthenium	do.	19,329	21,022	23,537	24,696 [r]	29,805
Other[3]	do.	4,169	107	59	-- [r]	--
Total	do.	229,913	236,641	266,150	276,401 [r]	302,981
Silver	do.	109,570	113,142	79,817	70,913 [r]	87,874
Titanium:[e]						
Ilmenite concentrate	thousand metric tons	1,750	1,800	2,000	1,900	1,900
Rutile concentrate	do.	120	120	150	150	150
Total	do.	1,870	1,920	2,150	2,050	2,050
Titaniferous slag[4]	do.	1,090	1,150	1,350	1,300	1,300
Uranium oxide		1,065	998	894	887 [r]	795
Vanadium, vanadium metal content		18,184	25,227	27,172	23,302	22,604
Zinc:						
Concentrate:						
Gross weight		113,400	118,900	103,100	80,000 [e]	80,000 [e]
Zn content		61,560	64,580	41,400	32,001 [r]	32,112
Metal, smelter, primary		109,000	111,000	113,000	104,000	102,000
Zirconium concentrate (baddeleyite and zircon)[e]		245,000	274,000	300,000	400,000	410,000
INDUSTRIAL MINERALS						
Andalusite		193,225	165,087	164,921	234,625	235,000 [e]
Asbestos, chrysotile		13,393	--	6,218	--	--
Cementitious products:						
Cement, finished product, sales	thousand metric tons	8,036	8,525	8,883	12,348 [r]	13,000 [e]
Granulated slag, fly ash, and others, sales	do.	1,129	1,099	1,280	1,436 [r]	1,500 [e]
Total	do.	9,165	9,624	10,163	13,784 [r]	14,500 [e]
Clays:						
Attapulgite		9,299	13,288	14,585	20,419	34,340
Bentonite		108,300	101,100	145,060	55,859	139,833
Fire clay		141,303	101,150	90,604	133,258	171,773
Flint clay, raw and calcined		50,848	41,963	53,279	53,367	36,607
Kaolin		83,500	86,700	86,365	81,901	59,356
Brick clay, local sales	thousand metric tons	5,823	6,203	7,593	9,392 [r]	11,097
Diamond, natural:						
Gem	thousand carats	4,465	4,350	5,144	5,800 [e]	6,400 [e]
Industrial	do.	6,698	6,526	7,540	8,500 [e]	9,400 [e]
Total	do.	11,163	10,876	12,684	14,295 [r]	15,776
Feldspar		66,736	57,197	57,738	53,721 [r]	57,534
Fluorspar:						
Acid-grade		272,068	216,000 [e]	221,000	250,000 [e]	230,000 [e]
Metallurgical-grade		14,319	11,000 [e]	14,000	15,000 [e]	15,000 [e]
Total		286,387	227,000	235,000	265,000	245,000 [e]
Gemstones, semiprecious, Tiger's eye[e]	kilograms	80,000	-- [2]	-- [2]	-- [e]	-- [e]
Gypsum, crude		382,830	421,861	394,069	452,271	547,581
Industrial or glass sand (silica)	thousand metric tons	2,132	2,262	2,312	2,174	2,200 [e]
Lime	do.	1,615	1,585	1,518	1,738	1,417
Magnesite, crude		36,500	87,200	86,100	65,900 [r]	66,000 [e]
Mica, scrap and ground		937	880	1,003	901	924
Nitrogen, N content of ammonia		505,900	491,900	493,200	459,100	460,000 [e]
Perlite[e]		400	400	400	400	400

See footnotes at end of table.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
INDUSTRIAL MINERALS--Continued						
Phosphate rock:						
Gross weight	thousand metric tons	2,550	2,803	2,643	2,735	2,577
Phosphorus pentoxide content	do.	995	1,086	1,030	1,070	1,000 [e]
Pigments, mineral, natural:						
Ochers		801	143	608	360	382
Oxides		51	109	156	152	128
Total		852	252	764	512	510
Salt		353,998	429,429	441,306	332,673 [r]	399,087
Silica	thousand metric tons	2,127	2,251 [r]	2,311 [r]	2,400 [r]	2,671
Sodium sulfate, natural		57,759	53,793	52,813	56,267	55,184
Stone, n.e.s.:						
Dimension:						
Granite and norite[5]		846,700	705,800	461,300	527,100	302,483
Slate		40,984	24,386	40,700	47,500	52,312
Crushed and broken:						
Limestone and dolomite	thousand metric tons	18,946	20,738	21,267	21,961	22,000 [e]
Quartzite	do.	7,412	318	--	--	--
Shale:						
For cement	do.	243	275	345	357	501
Other[5]	do.	67	67	49	50 [e]	50 [e]
Total	do.	310	342	394	407 [e]	551 [e]
Aggregate and sand, n.e.s.	do.	27,632	28,916	32,587	44,437	49,970
Sulfur:						
S content of pyrite (53.45%)	do.	150	183	176	165	133
Byproduct:						
Metallurgy	do.	265 [e]	179	174	180	250 [e]
Petroleum	do.	123	170	264	288	390 [e]
Total	do.	538	532	614	633	776
Talc and related materials:						
Talc		3,030	2,511	6,719	8,141 [r]	8,469
Pyrophyllite (wonderstone)		14,047	15,587	14,350	28,987 [r]	60,267
Vermiculite		156,632	210,000	182,802	196,893	209,801
MINERAL FUELS AND RELATED MATERIALS						
Coal (salable product):						
Anthracite	thousand metric tons	1,607	1,305	1,206	1,487 [r]	1,639
Bituminous	do.	221,882	218,895	238,105	241,885 [r]	243,368
Total	do.	223,489	220,200	239,311	243,372 [r]	245,007
Natural gas	million cubic meters	1,800 [e]	2,000 [e]	2,230 [r]	2,011 [r]	2,000 [e]
Petroleum:[6]						
Crude	thousand 42-gallon barrels	13,870	10,950	4,068	6,769	7,277
Refinery products:						
Liquefied petroleum gases	do.	3,758	3,677	3,561 [r]	3,538 [r]	3,500 [e]
Gasoline	do.	67,796	73,077	77,452 [r]	71,166 [r]	71,000 [e]
Jet fuel	do.	13,829	16,726	17,350 [r]	14,331 [r]	14,000 [e]
Kerosene	do.	11,108	4,754	4,831 [r]	4,893 [r]	4,900 [e]
Distillate fuel oil	do.	53,339	59,620	63,268 [r]	53,272 [r]	53,000 [e]
Residual fuel oil	do.	32,221	34,452	47,959 [r]	27,919 [r]	28,000 [e]
Other, includes lubricants and greases[e]	do.	19,500	21,000 [r]	21,000	17,000 [r]	17,000 [e]
Total[e, 7]	do.	202,000	213,000	235,000 [r]	192,000 [r]	191,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through November 30, 2006.

[2] Reported figure.

[3] Difference between total production reported by the South African Department of Minerals and Energy, Mineral Development Branch, Mineral Economics Directorate and palladium, platinum, and rhodium supplies (shipments) reported in Johnson and Matthey Annual Platinum Review. Includes iridium and ruthenium production plus excess palladium, platinum, and rhodium inventory.

[4] Except for about 45,000 metric tons per year, slag derived from titaniferous magnetite by Highveld Steel and Vanadium Corp. Ltd., titaniferous slag is all from the smelting of ilmenite and likely represents most of that mineral's production, for which data are unavailable.

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[5] Converted from reported cubic meters by using 1 cubic meter=2.7 metric tons.

[6] In addition, Sasol Ltd. produced about 67 million barrels per year of synthetic liquid petroleum fuels from coal.

[7] Excludes refinery fuel and losses.

Source: Mineral Economics Directorate, South Africa Department of Minerals and Energy.

TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	BHP Billiton Aluminium South Africa (Pty.) Ltd. (BHP Billiton Plc, 100%)	Hillside smelter at Richards Bay	700.
Do.	do.	Bayside smelter at Richards Bay	180.
Andalusite	Rhino Minerals (Pty.) Ltd. (Imerys, 100%)	Rhino Mine near Thabazimbi	120.
Do.	do.	Havercroft Mine at Penge	60.
Do.	Samrec Pty. Ltd. of France (Imerys, 100%)	Annesley Mine at Penge	75.
Do.	do.	Krugerspost Mine, near Lydenburg	50.
Do.	do.	Andalusite Refractories Mine at Groot Marico	15.
Do.	Hoogenoeg Andalusite (Pty.) Ltd.	Hoogenoeg Mine and plant	36.
Do.	Andalusite Resources (Pty.) Ltd. (African Mineral Trading and Exploration (Pty.) Ltd.)	Maroeloesfontein, near Thabazimbi, Northern Province	30.
Antimony	Consolidated Murchison Ltd. (Metorex Pty. Ltd., 100%)	Consolidated Murchison Mine near Gravelotte	7,000 antimony concentrate.
Cement	Pretoria Portland Cement Co. (Pty.) Ltd. (Barlworld Trust Co. Ltd., 68%)	De Hoek, Dwaalboom, Hercules, Port Elizabeth, Riebeeck, and Slurry plants	6,000.
Do.	Alpha Ltd. [Holcim Ltd. (Switzerland)]	Dudfield and Ulco plants	3,725.
Do.	Lafarge South Africa Ltd. [Lafarge (France)]	Lichtenburg plant in North West Province	2,345.
Do.	Natal Portland Cement Co. (Pty.) Ltd. (Cimentos de Portugal SGPS, S.A., 98%)	Simumu plant	970.
Chromite	Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Kroondal Mines at Rustenburg	2,460.
Do.	do.	Thornecliffe Mine at Steelpoort	1,440.
Do.	do.	Waterval Mine at Rustenburg	480.
Do.	do.	Boshoek Mine at Boshoek	360.
Do.	do.	Horizon Mine at Pilansberg	180.
Do.	do.	Chrome Eden Mine at Pilansberg	96.
Do.	Samancor Chrome Ltd. (Kermas Group Ltd., 100%)	Eastern Chrome Mines in Steelpoort Valley, Mpumalanga Province	2,000.
Do.	do.	Western Chrome Mines in Northern Province	1,800.
Do.	Assmang Ltd. (African Rainbow Minerals Ltd., 50%, and Assore Ltd., 50%)	Dwarsrivier Mine in Mpumalanga	880.[e]
Do.	Bayer (Pty.) Ltd.	Rustenburg Chrome Mine	450.
Do.	Dilokong Chrome Mine (Pty.) Ltd. (ASA Metals (Pty.) Ltd., 100%)	Dilokong Mine, near Lydenburg	320.[e]
Do.	Merafe Resources Ltd.	Horizon Mine	250.
Do.	National Manganese Mines (Pty.) Ltd.	Buffelsfontein Mine at Mooinooi	180.
Coal	Anglo Coal Ltd. (Anglo American plc, 100%)	Bank, Goedehoop, Isibonelo, Kleinkopje, Kriel, Landau, Mafube, New Denmark, New Vaal, and Nooitgedacht Mines	57,000.[e]
Do.	Ingwe Collieries Ltd. (BHP Billiton Plc, 100%)	Witbank Coalfield, Mpumalanga Province:	
Do.	do.	Middelburg Mine (Xstrata plc, 16% interest)	17,000 bituminous.
Do.	do.	Khutala Underground Mine	15,100 bituminous.
Do.	do.	Optimum Open Pit Mine	13,500 bituminous.
Do.	do.	Douglas Mine (Xstrata plc, 16% interest)	8,500 bituminous.
Do.	do.	Koornfontein Mines	5,200 bituminous.
Do.	do.	Klipspruit Mine	3,600 bituminous.
Do.	Zululand Anthracite Colliery (BHP Billiton Plc, 100%)	Zululand Mine, KwaZulu Natal Province	600 anthracite.[e]
Do.	Sasol Ltd.	Secunda Mines:	
Do.	do.	Twistdraai Mine	14,200.
Do.	do.	Brandspruit Mine	8,500.
Do.	do.	Middlebult Mine	8,500.
Do.	do.	Syferfontein Mine	8,200.

TABLE 2--Continued

SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal--Continued	Eyesizwe Coal (Pty.) Ltd.	Arnot, Glisa, Mafube, Matla, and New Clydesdale collieries	25,000.[e]
Do.	Kumba Resources Ltd. (Anglo American plc, 66%)	Grootegeluk Mine, 120 kilometers north of Thabazimbi	17,000.[e]
Do.	do.	Leeuwpan Colliery in Mpumalanga Province	2,700.
Do.	do.	Tshikondeni Mine in Venda	600.
Do. Do.	Xstrata plc	Tweefontein Division (Boschmans, Goedgevonden South Witbank, Waterpan, and Witcons Mines) at Witbank	6,500.
Do.	Xstrata plc, 50%	ATC and ATCOM Mines at Witbank	4,100.
Do.	do.	Mpumalanga Division (Spitzkop and Tselentis Mines) at Breyton and Ermelo	2,900.
Do.	do.	iMpunzi Division (Phoenix and Tavistock Mines) at Witbank	2,800.
Do.	Anker Holdings B.V.	Elandsfontein Mine	2,040.
Do.	do.	Golfview Mine	1,740.
Do.	Kangra Group Pty. Ltd.	Savmore and Welgedacht collieries	3,000.[e]
Do.	Wakefield Investments (Pty.) Ltd. (Metorex Pty Ltd., 74%)	Bankfontein, Lakeside, Leeuwfontein, and Middleburg Townlands Mines	2,300.[e]
Do.	Total Coal SA (Pty.) Ltd.	Dorsfontein and Forzando Mines	2,000.[e]
Do.	Graspan Colliery Pty Ltd.	Graspan Mine	1,800.
Do.	Kuyasa Mining (Pty.) Ltd.	Delmas Mine	1,200.[e]
Copper	Palabora Mining Co. Ltd. (Rio Tinto Ltd., 49%, and Anglo American plc, 29%)	Palabora Mines at Phalaborwa	80 copper in concentrate.
Do.	do.	Smelter at Phalaborwa	135 anodes.
Do.	do.	Refinery at Phalaborwa	130 cathodes.
Do.	Anglo American Platinum Corp. Ltd. (Anglo American plc, 74.1%)	Amandebult, Rustenburg, and Union sections; and Bafokeng Rasimone, Lebowa, Modikwa, Potgietersrust, and Western Limb Mines	13 mine.[e]
Do.	do.	Rustenburg Base Metal Refiners	12 refined.[e]
Do.	Black Mountain Mineral Development Co. (Pty.) Ltd. (Anglo American plc, 100%)	Black Mountain Mine near Aggeneys	6 copper in concentrate.
Do.	Lonmin Platinum (Lonmin plc., 73%, and Impala Platinum Holdings Ltd., 27%)	Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg and Limpopo Mine	3 mine.[e]
Do.	do.	Base Metals Refinery	4 refined.[e]
Do.	Impala Platinum Ltd. (Impala Platinum Holdings Ltd., 100%)	do.	NA.
Diamond thousand carats	De Beers Consolidated Mines Ltd. (Anglo American plc, 29%)	Venetia Mine in Northern Province	8,600.
Do. do.	do.	Finsch Mine, 100 kilometers west of Kimberley	2,200.
Do. do.	do.	Kimberley Mines, Kimberley	2,000.
Do. do.	do.	Cullinan Mine	1,100.
Do. do.	do.	Namaqualand Mines, 50 kilometers north of Port Nolloth	940.
Do. do.	do.	Koffiefontein Mine, 70 kilometers south of Kimberley	140 (closed in 2005).
Do. do.	do.	The Oaks	100.
Do. do.	Petra Diamonds Ltd.	Helam, Sedibang, and Star Mines	175.
Do. do.	Trans Hex Group Ltd.	Baken, Bloeddrif, Reuning, and Saxendrift Mines	140.[e]
Fluorspar	Witkop Fluorspar Mine (Pty.) Ltd. (Sallies Ltd.)	Witkop Mine, 250 kilometers west of Johannesburg	180.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Fluorspar--Continued	Vergenoeg Mining Corp. (Pty.) Ltd. [Metorex Pty. Ltd., 70%, and Minerales y Productos Derivados SA (Spain), 30%]	Vergenoeg Mine, 75 kilometers north of Pretoria	120.
Do.	Van den Heever Fluorspar Works	Van Den Heever Mine, 120 kilometers west of Johannesburg	50 metallurgical-grade fluorspar.[e]
Gold:			
Mine	AngloGold Ashanti Ltd. (Anglo American plc, 41.8%)	Vaal River operations:	
Do.	do.	Kopanang Mine	5,000 ore.
Do. kilograms	do.	do.	37,000 gold.
Do.	do.	Great Noligwa Mine	2,700 ore.
Do. kilograms	do.	do.	25,000 gold.
Do.	do.	Tau Lekoa Mine	5,000 ore.
Do. kilograms	do.	do.	20,000 gold.
Do.	do.	Vaal River Surface operations	5,800 ore.
Do. kilograms	do.	do.	3,000 gold.
Do. do.	do.	Moab Khotsong Mine	900 gold
Do.	do.	West Wits operations:	
Do.	do.	Tau Tona Mine	3,100 ore.
Do. kilograms	do.	do.	30,000 gold.
Do.	do.	Savuka Mine	3,000 ore.
Do. kilograms	do.	do.	20,000 gold.
Do.	do.	Mponeng Mine	1,900 ore.
Do. kilograms	do.	do.	17,000 gold.
Do.	Gold Fields Ltd.	Kloof Mine	5,280 ore.
Do. kilograms	do.	do.	36,000 gold.
Do.	do.	Driefontein Mine	6,660 ore.
Do. kilograms	do.	do.	36,000 gold.
Do.	do.	Beatrix Mine	4,800 ore.
Do. kilograms	do.	do.	22,000 gold.
Do.	Freegold Joint Venture (Harmony Gold Mining Co. Ltd., 50%, and African Rainbow Minerals Ltd., 50%)	Freegold operations	7,238 ore.
Do. kilograms	do.	do.	46,000 gold.
Do.	Harmony Gold Mining Co. Ltd.	Randfontein Mine	6,000 ore.
Do. kilograms	do.	do.	28,000 gold.
Do.	do.	Elandskraal Mines	2,280 ore.
Do. kilograms	do.	do.	21,000 gold.
Do.	do.	Free State operations	4,980 ore.
Do. kilograms	do.	do.	14,000 gold.
Do.	do.	Evander operations	1,776 ore.
Do. kilograms	do.	do.	13,000 gold.
Do.	do.	Target Mine	1,380 ore.
Do. kilograms	do.	do.	8,300 gold.
Do.	do.	Kalgold Mine	1,800 ore.
Do. kilograms	do.	do.	3,800 gold.
Do.	do.	Orkney and Welkom Mines	NA.
Do.	Western Areas Ltd. (JCI Gold, 50%, and Placer Dome Inc., 50%)	South Deep Mine	2,700 ore
Do. kilograms	do.	do.	19,000 gold.
Do.	Durban Roodeport Deep Ltd.	Blyvooruitzicht and Doornfontein section	4,800 ore.
Do. kilograms	do.	do.	6,900 gold.
Do.	do.	Crown section--tailings retreatment	11,760 ore.
Do. kilograms	do.	do.	4,700 gold.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold--Continued:				
Mine--Continued		Durban Roodeport Deep Ltd.	East Rand Proprietary Mine	1,800 ore.
Do.	kilograms	do.	do.	2,500 gold.
Do.		Thistle Mining, Inc.	President Steyn Gold Mines in Free State	1,200 ore.
Do.	kilograms	do.	do.	6,500 gold.
Do.	do.	Barberton Mines Ltd. [Metorex Ltd., 54%, and Shanduka Resources (Pty.) Ltd., 26%]	Eastern Transvaal Consolidated Division (Fairview, New Consort, and Sheba Mines)	3,200.[e]
Do.		Simmer and Jack Mines Ltd.	North West Operations	NA.
Refined	metric tons	Rand Refinery Ltd.	Germiston, Gauteng Province	1,200.
Do.	do.	Harmony Gold Mining Co. Ltd.	Musuku Beneficiation Services	110.
Iron and steel:				
Iron ore		Kumba Resources Ltd.	Sishen Mine at Sishen	28,000.
Do.		do.	Thabazimbi Mine in Limpopo Province	2,400.
Do.		Assmang Ltd.	Beeshoek Mine near Postmasburg	6,000.
Do.		Highveld Steel and Vanadium Corp. Ltd. (Anglo American plc, 79%)	Mapochs Mine at Roossenekal, 60 kilometers west of Lydenburg	2,450.
Do.		Xstrata plc	Rhovan Mine at Brits	400.
Do.		Vametco Minerals Corp. (Strategic Minerals Corp., USA, 100%)	Krokodilkraal Mine and plant near Brits	180.
Ferroalloys		Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Rustenburg	430 ferrochromium.
Do.		Xstrata plc, 69.6%	Lydenburg	396 ferrochromium.
Do.		Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Wonderkop	362 ferrochromium.
Do.		do.	Boshoek	240 ferrochromium.
Do.		Xstrata plc, 50%	Gemini plant at Marikana	191 ferrochromium.
Do.		Samancor Chrome Division (Kermas Group Ltd., 100%)	Ferrometals plant at Witbank	415 ferrochromium.
Do.		do.	Tubatse Ferrochrome plant at Steelpoort	340 ferrochromium.
Do.		do.	Middelburg Ferrochrome plant 35 kilometers east of Witbank	235 ferrochromium.
Do.		Hernic Ferrochrome (Pty.) Ltd. (Mitsubishi Corp., 51%)	Plant at Brits	420 ferrochromium.
Do.		Assmang Ltd.	Machadodorp plant in Mpumalanga Province	290 ferrochromium.
Do.		Merafre Resources Ltd. (Royal BafoKeng Nation, 33.2%, and Industrial Development Corporation of South Africa Ltd., 25.2%)	Smelter at Boshoek, North West Province	235 ferrochromium.
Do.		ASA Metals (Pty.) Ltd. (Eastern Asia Metal Investment Co. Ltd., 60%, and Northern Province Development Corp., 40%)	Plant near Pietersburg, Northern Province	120 ferrochromium.
Do.		Samancor Manganese Division (BHP Billiton Plc, 54.6%; Anglo American plc, 28.9%; other private, 16.5%)	Metalloys Ltd. plant at Meyerton; can switch between ferromanganese and silicomanganese	560 high-carbon ferromanganese; 200 silicomanganese.
Do.		Assmang Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.		Advalloy (Pty.) Ltd. (BHP Billiton/Samancor, 50%; Japan Metals & Chemicals Co., 35%; Mitsui & Co. Ltd., 15%)	Furnace at Samancor's Meyerton Plant	75 ferromanganese.
Do.		Transalloys Division (Highveld Steel and Vanadium Corp. Ltd., 100%)	Plant at Witbank	45 medium-carbon ferromanganese.
Do.		do.	do.	170 silicomanganese.
Do.		Silicon Technology Pty Ltd.	NA	55 ferrosilicon.
Do.		Highveld Steel and Vanadium Corp.	Rand Carbide plant	55 ferrosilicon.
Do.	metric tons	do.	Vanchem plant at Witbank	12,500 ferrovanadium.
Do.	do.	Xstrata plc	Rhovan plant at Brits	7,800 ferrovanadium.
Do.	do.	Vametco Minerals Corp. (Strategic Minerals Corp., 100%)	Smelter near Brits	5,250 ferrovanadium.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel--Continued:				
Steel		Mittal Steel South Africa Ltd.	Newcastle, Saldanha, Vanderbijlpark, and Vereeniging plants	7,100 crude steel.
Do.		Highveld Steel and Vanadium Corp. Ltd. (Anglo American plc, 79%)	Witbank	1,000 iron; 1,000 crude steel.
Do.		Columbus Stainless (Pty.) Ltd. (Acerinox SA, 76%)	Stainless steel plant at Middelburg	750 crude steel.
Do.		Scaw Metals Division (Anglo Operations Ltd.)	Germiston plant, Johannesburg	600 crude steel.
Do.		Davsteel Division (Cape Gate Pty. Ltd.)	Vanderbijlpark plant, Gauteng	480 crude steel; 480 billet.
Do.		Cape Town Iron & Steel Works (Pty.) Ltd.	Kuilsrivier plant, Cape Town	250 crude steel; 250 billet.
Do.		Duferco Steel Processing Ltd.	Cold-rolled slab steel at Saldanha Bay	240 rolled steel.
Lead		Black Mountain Mineral Development Co. (Pty.) Ltd.	Black Mountain Mine near Aggeneys	54 lead in concentrate.
Lime		PPC Lime Ltd. (subsidiary of Pretoria Portland Cement Company Ltd.)	Plant at Lime Acres	1,200.
Do.		Idwala Lime (Idwala Industrial Holdings)	Plant at Danielskuil	1,000.
Do.		Inca Lime (Pty.) Ltd. (subsidiary of Inca Mining (Pty.) Ltd.)	Plant at Immerpan, Limpopo Province	100.
Manganese		Assmang Ltd.	Nchwaning Mine near Black Rock	3,000 ore.
Do.		do.	Gloria Mine near Black Rock	600 ore.
Do.		Samancor Ltd. (BHP Billiton Plc, 60%, and Anglo American plc, 40%)	Mamatwan and Wessels Mines near Hotazel	3,400 ore.
Do.		Metmin (Metorex Pty. Ltd., 100%)	Open pit mine in North West Province	24 manganese dioxide.
Do.		Manganese Metal Co. Pty. Ltd. (BHP Billiton Plc, 51%)	Electrolytic plant at Nelspruit	30 manganese metal.
Do.		do.	Electrolytic plant at Krugersdorp	20 manganese metal.
Nickel		Anglo American Platinum Corp. Ltd.	Amandebult, Rustenburg, and Union sections; and Bafokeng Rasimone, Lebowa, Modikwa, Potgietersrust, and Western Limb Mines	24 mine.[e]
Do.		do.	Rustenburg Base Metal Refiners	22 refined.[e]
Do.		Impala Platinum Ltd.	Impala Mines	8 mine.[e]
Do.		do.	Impala Refining Services	10 refined.[e]
Do.		do.	Base Metals Refinery	14 refined.[e]
Do.		Lonmin Platinum	Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg and Limpopo Mine	5 mine.[e]
Do.		do.	Base Metals Refinery	7 refined.[e]
Do.		Nkomati Joint Venture (African Rainbow Minerals Ltd., 50%, and LionOre Mining International Ltd, 50%)	Nkomati Mine in Mpumalanga Province	5.
Petroleum:				
Crude	thousand 42-gallon barrels	Petroleum Oil and Gas Corporation of South Africa, 55%, and Pioneer Natural Resources Company, 45%	Pioneer offshore field	21,900.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Oribi field 140 kilometers southwest offshore from Mossel Bay	9,100.
Do.	do.	do.	Oryx field	4,400.
Refined	do.	Shell and BP Refineries Pty. Ltd. (Shell SA Energy, 50%, and BP Southern Africa, 50%)	Sapref refinery in Durban	63,900.
Do.	do.	Engen Ltd. (62%)	Engen refinery in Durban	54,800.
Do.	do.	Caltex Oil SA Pty. Ltd. (private, 100%)	Calref refinery in Cape Town	40,200.
Do.	do.	National Petroleum Refiners of South Africa Pty. Ltd. (Sasol Ltd., 63.6%)	Natref refinery in Sasolburg	32,000.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Phosphate rock		Phosphate Development Corp. Ltd. (Foskor Ltd.) (Industrial Development Corp., 100%)	Foskor Mine and plant at Phalaborwa	3,850 phosphate rock.[2]
Do.		Fer-Min-Ore Ltd.	Plant at Germiston	30.
Do.		do.	Plant at Isithebe	12.
Platinum-group metals		Anglo American Platinum Corp. Ltd.	Rustenburg section near Rustenburg	12,420 ore.
Do.	kilograms	do.	do.	27,000 platinum; 13,000 palladium; 3,700 rhodium.
Do.		do.	Amandelbult section, 50 kilometers south of Thabazimbi mines	4,080 Merensky ore; 2,640 UG2 ore.
Do.	kilograms	do.	do.	20,000 platinum; 9,400 palladium; 2,700 rhodium.
Do.		do.	Union section, 50 kilometers south of Thabazimbi	6,000 ore.
Do.	kilograms	do.	do.	9,200 platinum; 4,200 palladium; 1,700 rhodium.
Do.		Bafokeng Rasimone Platinum Mine (Anglo American Platinum Corp. Ltd., 50%, and Royal Bafokeng Nation, 50%)	Bafokeng Rasimone Mine in Northern Province	2,400 ore.
Do.	kilograms	do.	do.	11,000 platinum; 4,500 palladium; 880 rhodium.
Do.	do.	Kroondal Platinum Mines (Anglo American Platinum Corp. Ltd., 50%, and Aquarius Platinum Ltd, 25.5%)	Kroondal Mine	9,300 platinum; 4,600 palladium; 1,700 rhodium.
Do.		Modikwa Platinum Mine (Anglo American Platinum Corp. Ltd., 50%; and African Rainbow Minerals, 50%)	Modikwa Mine	2,400 ore.
Do.	kilograms	do.	do.	7,300 platinum; 7,300 palladium; 440 rhodium.
Do.		Anglo American Platinum Corp. Ltd.	Potgietersrust Platinum Mine	4,620 ore.
Do.	kilograms	do.	do.	6,400 platinum; 6,800 palladium; 440 rhodium.
Do.		do.	Lebowa Platinum (Atok) Mine, 70 kilometers east of Potgietersrus	960 Merensky ore; 600 UG2 ore.
Do.	kilograms	do.	do.	3,300 platinum; 2,300 palladium; 350 rhodium.
Do.		do.	Western Limb Mine	5,400 ore.
Do.	kilograms	do.	do.	1,700 platinum; 560 palladium; 120 rhodium.
Do.		do.	Polokwane smelter	650 concentrate.
Do.		do.	Mortimer smelter	600 concentrate.
Do.		do.	Waterval smelter	200 concentrate.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Platinum-group metals--Continued	kilograms	Anglo American Platinum Corp. Ltd.	Mortimer, Polokwante, and Waterval smelters	110,000 platinum; 60,000 palladium; 15,000 rhodium.
Do.	do.	do.	Precious Metals Refinery	110,000 platinum metal; 60,000 palladium metal; 15,000 rhodium metal.
Do.		Impala Platinum Ltd. (Impala Platinum Holdings Ltd., 100%)	Impala Mines, near Rustenburg in Northwest Province	17,000 ore.
Do.	kilograms	do.	do.	34,000 platinum; 16,000 palladium; 4,000 rhodium.
Do.		Impala Platinum Ltd.	Marula Mine	2,200 ore.
Do.	kilograms	do.	do.	2,700 platinum; 2,600 palladium; 540 rhodium.
Do.	do.	do.	Smelter	62,000 platinum; 29,000 palladium; 7,200 rhodium.
Do.	do.	do.	Precious metals refinery, near Springs in Guateng Province	62,000 platinum metal; 29,000 palladium metal; 7,200 rhodium metal.
Do.		Lonmin plc	Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg	14,400 ore.[e]
Do.	kilograms	do.	do.	29,000 platinum;[e] 13,000 palladium;[e] 4,000 rhodium.[e]
Do.		do.	Limpopo Mine	1 0,00 ore.[e]
Do.	kilograms	do.	do.	1,500 platinum;[e] 1,100 palladium;[e] 170 rhodium.[e]
Do.	do.	do.	Precious Metals Refinery at Western Platinum	31,000 platinum metal; 14,000 palladium metal; 4,000 rhodium metal.
Do.		Marikana Platinum Mine (Anglo American Platinum Corp. Ltd., 50%, and Aquarius Platinum Ltd, 50%)	Marikana Mine	3,000 ore.
Do.	kilograms	do.	do.	4,000 platinum; 1,600 palladium; 500 rhodium.
Do.		Everest South Platinum Mine (Aquarius Platinum Ltd., 50.5%, and Impala Platinum Holdings Ltd, 20%)	Everest South Mine	3,000 ore.
Do.	kilograms	do.	do.	3,000 platinum; 1,700 palladium; 400 rhodium.
Do.	do.	Northam Platinum Ltd. (Anglo American Platinum Corp. Ltd., 22.5%, and Mvelaphanda Resources Ltd., 21.9%)	Northam Mine, 20 kilometers south of Thabazimbi	1,800 Merensky ore; 900 UG2 ore.
Do.	do.	do.	do.	7,900 platinum; 3,800 palladium; 700 rhodium.
Pyrophyllite		Idwala Industrial Minerals (Benoni)	Ottsdal Mine in North West Province	15.
Do.		Wonderstone Ltd. (The Associated Ore & Metals Corp. Ltd.)	Pyrophylite (wonderstone) mine, North West Province	NA.
Do.		G&W Base and Industrial Minerals Pty. Ltd.	Piet Retief Mine	NA.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Silicon		Silicon Smelters (Pty.) Ltd. (Anglo American plc, BHP Billiton Plc, and Pechiney Metallurgie)	Polokwane plant, near Pietersburg, Limpopo Province	45 silicon; 15 silica fume.
Silver	metric tons	Rand Refinery Ltd.	Germiston, Gauteng Province	200 refined silver.
Synthetic fuels	thousand 42-gallon barrels	Sasol Ltd.	Coal to oil plant at Secunda and a coal to petrochemical plant at Sasolburg	54,800.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Natural gas to petroleum products plant at Mossel Bay	18,300.
Tantalum	metric tons	Titan Processors (Pty.) Ltd. (subsidiary of Pinnacle Resources Inc.)	Plant at Johannesburg	360 tantalum oxide.
Titanium:				
Titanium concentrates		Richards Bay Minerals (Rio Tinto Plc., 50%, and BHP Billiton Plc, 50%)	Open cast operations, near Richards Bay	1,280 ilmenite;[e] 125 rutile.[e]
Do.		Namakwa Sands Ltd. (Anglo Operations Ltd., a subsidiary of Anglo American plc, 100%)	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	540 ilmenite; 25 rutile.
Do.		Ticor SA (Kumba Resources Ltd., 100%)	Hillendale Mine near Richards Bay, KwaZulu Natal Province	550 ilmenite; 20 rutile; 5 leucoxene.
Titanium slag		Richards Bay Iron and Titanium (Pty.) Ltd./ Richards Bay Minerals (Rio Tinto Plc.)	Smelter at Richards Bay	1,060 titanium slag; 110 rutile.
Do.		Namakwa Sands Ltd.	Smelter at Vredenberg, Saldanha Bay area	200 titanium slag.
Do.		Highveld Steel and Vanadium Corp. Ltd.	Steel plant at Witbank	48 titanium slag.[e]
Do.		Ticor SA (Kumba Resources Ltd., 100%)	Empangeni smelter near Richards Bay, KwaZulu Natal Province	250 titanium slag.
Uranium oxide	metric tons	AngloGold Ashanti Ltd.	Vaal Rivers operation, near Klerksdorp	3,000.
Vanadium pentoxide	do.	Highveld Vanadium and Chemicals Division (Anglo American plc through Highveld Steel and Vanadium Corp. Ltd.)	Mapochs Mine near Lydenburg	25,000.[e]
Do.	do.	do.	Highveld steel plant in Witbank	17,000.
Do.	do.	do.	Highveld Vantra plant in Witbank	8,000.
Do.	do.	Xstrata plc	Rhovan Mine at Brits	10,600.
Do.	do.	Vametco Minerals Corp. (Strategic Minerals Corp., USA, 100%)	Krokodilkraal Mine and plant near Brits	5,400.
Do.	do.	Transvaal Alloys Pty. Ltd. (Highveld Steel and Vanadium Corp., 100%)	Wapadskloof Mine and plant, 60 kilometers northeast of Middelburg	2,250.[e]
Vermiculite		Palabora Mining Co. Ltd.	Palabora mine and plant at Phalaborwa	223.
Zinc		Zinc Corp. of South Africa Ltd. (Kumba Resources Ltd., 100%)	Struisbult Springszinc refinery at Springs, southeast of Johannesburg	110 refined zinc; 170 sulfuric acid.
Do.		Black Mountain Mineral Development Co. (Pty.) Ltd.	Black Mountain Mine near Aggeneys	41 zinc in concentrate.
Zirconium		Tisand (Pty.) Ltd./Richards Bay Minerals	Open cast mines near Richards Bay	300 zircon in concentrate.
Do.		Namakwa Sands Ltd.	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	125 zircon in concentrate.
Do.		Ticor SA	Hillendale Mine near Richards Bay, KwaZulu Natal Province	45 zircon in concentrate.
Do.		do.	Zirconium basic sulfate plant at Phalaborwa	8 zirconium basic sulfate.
Do.		do.	Fused zirconia plant	6 synthetic zirconia.

[e] Estimated. NA Not available.

[1] Based on information available as of February 2007.

[2] Most of Foskor's phosphate output is from phosphate concentrates supplied by the neighboring Palabora copper mine.

THE MINERAL INDUSTRY OF SUDAN

By Thomas R. Yager

In Sudan, rising production of crude petroleum in recent years has substantially increased the mineral sector's influence on the national economy. Other mineral commodities produced included cement, chromite, gold, gypsum, marble, refined petroleum products, salt, semimanufactured steel, and silver. Sudan is also known to have deposits of barite, copper, iron ore, kyanite, lead, nickel, talc, tungsten, wollastanite, and zinc.

Sudan's real gross domestic product (GDP) increased by 8% in 2005 after rising by a revised 5.2% in 2004. The petroleum sector accounted for 15% of the GDP in 2005; manufacturing, 7%; building and construction, 4%; electricity and water, 1%; and mining and quarrying, less than 1%. In 2005, the nominal GDP amounted to nearly $85 billion when adjusted for purchasing power parity. The per capita GDP based on purchasing power parity was about $2,400 (Bank of Sudan, 2006b, p. 34; International Monetary Fund, 2006§[1]).

In 2005, the petroleum sector grew at a rate of 11.3%, and other extractive industries, by 2%. The petroleum sector accounted for 20% of the growth in Sudan's real GDP in 2005. The electricity and water sector grew by 8.5%; construction, 5%; and manufacturing, 2.8% (Bank of Sudan, 2006b, p. 34).

Civil war and social strife in Sudan limited, to a large extent, investment in the mineral sector and other sectors of the economy. Sanctions by the United Nations (1996) and the United States (1997) set legal barriers to investment in the country and were followed by the Sudan Peace Act that was ratified by the Congress of the United States in 2002. The purpose of the Sudan Peace Act was to block loans to Sudan from international financial institutions if the Government of Sudan were to reject peace negotiations with the Sudanese People's Liberation Army (SPLA). The alleged use of revenues from petroleum sales to finance operations in the Sudan conflicts constituted one of the reasons for promulgating the Act (U.S. Department of the Treasury, 2000; Africa Energy Intelligence, 2002).

On December 31, 2004, the Government signed a permanent cease-fire with the SPLA, and a comprehensive peace agreement was signed on January 9, 2005. The agreement included protocols for sharing legislative power and natural resources. The agreement did not address the separate conflict in Darfur (United Nations Integrated Regional Information Networks, 2005b).

Commodity Review

Metals

Gold.—The Ariab Mining Company Ltd. (AMC) operated the Hassai Mines, which was Sudan's only large-scale gold producer. The company held other gold concessions in Sudan. In 2005, AMC produced 4,728 kilograms (kg) of gold at Hassai. Reserves at Hassai were estimated to be 4.1 million metric tons at a grade of 4.95 grams per metric ton gold. The life of the mine was expected to be 4 years; the reprocessing of tailings could extend the mine's life by 7 years (La Mancha Resources Inc., 2006).

In 2005, gold exports amounted to 8,517 kg at a value of $63.6 million, or about 1% of total exports. In addition to the gold produced and exported by AMC and Sudanese artisanal miners, some of Ethiopia's artisanal gold output was reported to be smuggled through Sudan (Bank of Sudan, 2006a, p. 8).

Iron and Steel.—Sudan Master Technology operated a meltshop and rolling mill in Giad Industrial City. In 2004 (the latest year for which data were available), the production of rebar at Giad Industrial City decreased to 35,740 metric tons (t) from 63,936 t in 2003. In 2005, imports of iron and steel were $717 million compared with $342 million in 2004. Iron and steel accounted for nearly 11% of Sudan's total imports (Bank of Sudan, 2006a, p. 31-32; undated, p. 4.9).

Industrial Minerals

Cement.—In 2004 (the latest year for which data were available), national cement production rose to 307,100 t from 271,900 t in 2003. The Atbara and the Rabak cement plants had a combined capacity of 500,000 metric tons per year. In 2004, production at Atbara increased to 240,000 t from 199,900 t in 2003; production at Rabak decreased to 67,100 t from 72,000 t (Bank of Sudan, undated, p. 4.13).

Mineral Fuels

In 2005, Sudan's production of crude petroleum was about 120 million barrels (Mbbl) compared with 118 Mbbl in 2004 and 103.4 Mbbl in 2003. Sudan accounted for nearly 4% of African crude petroleum production in 2004. Domestic petroleum reserves were not less than 2.7 billion barrels (Gbbl).

The Greater Nile Petroleum Operating Company (GNPOC) [a joint venture of China National Petroleum Corp. (CNPC) (40%), Petronas Carigali Overseas Shd. Bhd. of Malaysia (30%), ONGC Videsh Ltd. of India (25%), and Sudan Petroleum Company Ltd. (Sudapet) (5%)] held Blocks 1, 2, and 4 in south central Sudan. GNPOC produced crude petroleum from the Bamboo, the Diffra, the el-Toor, the Grand Heglig, the Khairat Northeast, the Tooma South, and the Unity oilfields. In 2004, GNPOC produced 314,800 barrels per day (bbl/d) from Blocks 1, 2, and 4 compared with 283,400 bbl/d in 2003. Reserves in Blocks 1, 2, and 4 were estimated to be more than 1 Gbbl in 2004 (Nield, 2004; Africa Energy Intelligence, 2005a).

CNPC held Block 6, which was located to the northwest of Muglad. Reserves in Block 6 were reported to be 700 Mbbl. In 2005, CNPC produced at the Fula Field in Block 6 at a rate of about 10,000 bbl/d. Production was expected to rise to 99,000 bbl/d in 2006 and 2007 and eventually to 170,000 bbl/d

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[1] References that include a section mark (§) are found in the Internet References Cited section.

(Nield, 2004; Peng, 2006; United Nations Joint Logistics Center, 2006, p. 31).

Blocks 3 and 7 in eastern Sudan were held by the Petrodar Consortium [CNPC (41%), Petronas (40%), Sudapet (8%), Gulf Petroleum Company of Qatar (6%), and the Al-Thani Group of Sudan (5%)]. The Adar-Yale field near Malakal produced small amounts of crude petroleum that were refined at El Obeid. Blocks 3 and 7 had reserves of 775 Mbbl. CNPC, which was the operating company, planned to start production in Blocks 3 and 7 in 2006 at an initial rate of 75,000 bbl/d. The company planned to increase output to 150,000 bbl/d by the end of 2006; production could rise eventually to between 300,000 bbl/d and 350,000 bbl/d (Nield, 2004; Sudan Tribune, 2006§).

Blocks 5A and 5B were located in the Muglad Basin. Block 5A was held by White Nile Petroleum Operating Company [Petronas (68.9%), ONGC Videsh (24.1%), and Sudapet (7%)]; reserves at the Thar Jath field in Block 5A were reported to be 250 Mbbl. Block 5B was held by Petronas (39%), Lundin Petroleum AB of Sweden (24.5%), ONGC Videsh (23.5%), and Sudapet (13%). In March 2005, White Nile signed an agreement with the Government to develop the Thar Jath field. Production at Thar Jath was expected to reach its initial capacity of 80,000 bbl/d by the end of March 2006. In December, Petronas announced plans to start exploration in Block 5B in early 2006; the drilling of up to three exploration wells would commence by the end of 2006 (Lundin Petroleum AB, 2005; Reuters, 2005).

Sudapak Operating Company [Zaver Petroleum Corp. Ltd. of Pakistan (85%), and Sudapet (15%)] held Block 9 in the vicinity of Khartoum; Block 11 in Gezira, North Kordofan, Northern, and White Nile States to the west of Block 9; and Block A in southern Sudan near Blocks 1, 2, 5A, 5B, 7, and B. In 2005, the first well drilled in Blocks 9 and 11 was dry. Sudapak also explored for petroleum in Block A, which was bordered to the southwest by Blocks 5A and 5B and to the northwest by Block 7 (United Nations Joint Logistics Center, 2006, p. 32).

Block 14 in northwestern Sudan was held by the state-owned company PetroSA (Pty) Ltd. of South Africa and Sudapet. In 2005, the companies started a preexploration study in Block 14; an exploration and production-sharing agreement could be signed if the study yields favorable results (United Nations Joint Logistics Center, 2006, p. 32).

In December 2004, Kuwait Petroleum Corp., Marathon Oil Corp., and Total S.A., renegotiated their production-sharing agreement with the Government for Block B in southern Sudan. The original agreement was signed in 1983; the companies had suspended their involvement in the development of the block because of civil unrest. In February 2005, the government of South Sudan awarded a 60% interest in Block Ba, which was part of Block B, to White Nile of the United Kingdom; the remaining 40% was awarded to Nile Petroleum Corp., which was owned by the government of South Sudan. Total disputed White Nile's control of Block Ba; the national Government confirmed the ownership of Block Ba by Total and its joint-venture partners in September 2005 (Africa Energy Intelligence, 2005d).

Block C, which is located to the southwest of Block 6 in western Sudan, was held by the Advanced Petroleum Company [Cliveden Petroleum Company of Switzerland (37%), Hi-Tech Petroleum of Sudan (28%), Sudapet (17%), the government of Khartoum State (10%), and Heglieg Petroleum (8%)]. In late 2005, Cliveden agreed to sell its interest in Block C to High Tech Group (Africa Energy Intelligence, 2005b).

In March 2005, the government of Khartoum State signed a memorandum of understanding with Videocon of India to explore for petroleum in Block 13, which is located north of Port Sudan on the Red Sea. In September, the government awarded the exploration rights to Block 15 to the Red Sea Petroleum Operating Company [CNPC (35%), Petronas (35%), Sudapet (15%), Express Petroleum and Gas Company of Nigeria (10%), High Tech Group (5%)]. Block 15 was an onshore and offshore block located in the Red Sea between Port Sudan and the border with Eritrea. At the end of 2005, Block 10 in Gedaraf State and Blocks 12A and 12B in Darfur State remained unawarded. The civil war in Darfur inhibited the development of Block 12 (Africa Energy Intelligence, 2005c; United Nations Joint Logistics Center, 2006, p. 32).

In 2004 (the latest year for which data were available), Sudan's output of petroleum products increased to 25.6 Mbbl from about 22.5 Mbbl in 2003 (table 1). The Khartoum Oil Refinery, which was operated by CNPC, accounted for a majority of the country's refining capacity. The refinery had a capacity of 50,000 bbl/d in 2003; CNPC increased capacity to 60,000 bbl/d in 2004 and 90,000 bbl/d in 2005. The company planned a further expansion to 120,000 bbl/d in November 2005 but was forced to delay this project until June 2006. In November 2003, the Government awarded a contract to ONGC Videsh to increase the capacity of the Port Sudan Refinery to 150,000 bbl/d from about 25,000 bbl/d. The upgrade was expected to be completed in 2009 (Clark, 2004; United Nations Joint Logistics Center, 2006, p. 10-11). Sudan also had topping plants at Abu Jabra, El Obeid, and Shajirah that produced mainly heavy fuel oil.

In 2005, exports of crude petroleum were $3.95 billion compared with $2.96 billion in 2004. Crude petroleum accounted for 82% of the value of Sudan's total exports in 2005. China accounted for 81% of Sudan's crude petroleum and petroleum product exports, and Japan, 14% (Bank of Sudan, 2006a, p. 14, 18, 20).

In 2005, exports of petroleum products were $239 million compared with $142 million in 2004. Petroleum products accounted for 5% of the value of Sudan's total exports in 2005. Imports of petroleum products were $322 million in 2005 compared with $101 million in 2004. Petroleum products accounted for nearly 5% of the value of Sudan's imports in 2005 (Bank of Sudan, 2006a, p. 14, 31-32).

Infrastructure

In 2004 (the latest year for which data were available), domestic production of electricity increased to 3,749 gigawatthours (GWh) from 3,354 GWh in 2003. Thermal power stations generated 2,608 GWh in 2004 compared with 2,191 GWh in 2003; production from hydroelectric power stations fell to 1,140 GWh from 1,163 GWh. Domestic consumption of electricity increased to 2,495 GWh in 2004 from 2,320 GWh in 2003; industrial consumption fell to 419 GWh from 514 GWh.

A new hydroelectric plant with a capacity of 1,250 megawatts was expected to be completed in mid- to late 2007 (United Nations Joint Logistics Center, 2006, p. 4; Bank of Sudan, undated, p. 4.15-4.16).

The 1,610-km crude petroleum pipeline that ran from Blocks 1, 2, and 4 to the El Obieid and the Khartoum refineries and Sudan's Red Sea coast was commissioned in mid-1999. In late 2004, CNPC completed a 730-km crude petroleum pipeline from the Fula Field in the Block 6 oilfields to the Khartoum Oil Refinery. In 2005, the 1,400-km Petrodar crude petroleum pipeline that runs from Blocks 3 and 7 to the coast was completed. Also in 2005, a consortium of Indian companies led by ONGC Videsh completed a new 741-km petroleum products pipeline that runs from the Khartoum Oil Refinery to Port Sudan in 2005 (Clark, 2004; Nield, 2004; United Nations Joint Logistics Center, 2006, p. 32).

Outlook

The International Monetary Fund (2006§) predicted that Sudan's GDP would rise by 13% in 2006 and 10.3% in 2007. High rates of GDP growth may lead to increased demand for such local construction materials as cement, gravel, limestone, marble, and sand. With the start of production in Blocks 3, 5A, and 7, and higher production from Block 6, Sudan's crude petroleum output could rise to as much as 620,000 bbl/d by the end of 2006. Plans to increase petroleum production depend upon political stability; the success of the peace agreement between the Government and the SPLA is a key factor. The separate conflict in Darfur, which contained parts of Blocks C and 12, remained unresolved at the end of 2005 (United Nations Integrated Regional Information Networks, 2005a).

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TABLE 1

SUDAN: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2001	2002	2003	2004	2005[e]
Cement, hydraulic	metric tons	189,500	204,800	271,900	307,100	280,000
Chromite, mine output, gross weight[3]	do.	20,500	14,000	37,000	26,000	26,000
Gold, mine output, Au content[5]	kilograms	5,417	5,239	5,106	5,000 [e]	4,728 [4]
Gypsum	metric tons	2,422	4,540	13,304	14,000 [e]	14,000
Marble	cubic meters	15,500	22,000	22,000	22,000 [e]	22,000
Petroleum:						
Crude, including lease condensate	thousand 42-gallon barrels	77,755	87,759	103,400	118,000	120,000
Refinery products:						
Liquefied petroleum gas	do.	2,493	2,792	2,658	3,235 [r]	3,300
Gasoline	do.	7,183 [r]	7,546 [r]	7,318 [r]	8,109 [r]	8,200
Naphtha	do.	198	303	260	248 [r]	250
Jet fuel	do.	910	1,339	1,236	1,562 [r]	1,600
Kerosene	do.	230	259	282	294 [r]	300
Distillate fuel oil	do.	7,198 [r]	7,631 [r]	8,241 [r]	9,708 [r]	9,800
Residual fuel oil	do.	1,656	1,991	2,503	2,444 [r]	2,500
Total	do.	19,868 [r]	21,861 [r]	22,498 [r]	25,600 [r]	26,000
Salt	metric tons	77,783	83,340	61,096	62,000 [e]	62,000
Silver	kilograms	1,598	3,256	2,844	2,900 [e]	2,900
Steel, semimanufactured	metric tons	42,785	53,035	63,936	35,740 [r]	36,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through November 30, 2006.

[2] In addition to the commodities listed, the following are presumably produced although available information is inadequate to estimate output: clay and/or shale for cement manufacture (normally about 0.4 metric ton of clay and/or shale per metric ton of finished cement); limestone for cement manufacture (normally at least 1.25 metric tons per metric ton of finished cement), agriculture, lime manufacture, and construction aggregate and fill; other construction materials (clays, sand and gravel, stone, and others for local use); and mica.

[3] Presumed to be ores and concentrates with an estimated average grade of about 54% chromic oxide.

[4] Reported figure.

[5] Does not include artisanal output.

TABLE 2
SUDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Atbara Cement Company Ltd. (LaFarge Group of France and Dal Group of Sudan)	Plant at Atbara	400,000.
Do.		Nile Cement Company (Government, 100%)	Plant at Rabak	100,000.
Chromite		Ingessana Hills Mines Corp.	Mine at Ingessana Hills	48,000.
		Elneelain Works Co.	NA	NA.
Gold	kilograms	Compagnie Miniere Or [Government of Sudan, 60%, and Ariab Mining Company Ltd. (AMC), 40%]	Mines at Hassai	5,000.
Gypsum		Sudanese Mining Corp. (Government, 100%)	Bir Eit Mine	15,000.
Limestone		Atbara Cement Company Ltd.	Mine at Atbara	500,000.
Do.		Nile Cement Company	Mine at Rabak	200,000.
Mica		Sudanese Mining Corp. (Government, 100%)	Sheriek Mines	1,800.
Petroleum:				
Crude	thousand barrels	Greater Nile Petroleum Operating Co. (GNPOC) [China National Petroleum Corp. (CNPC), 40%; Petronas Carigali Overseas Shd. Bhd., 30%; ONGC Videsh Ltd., 25%; Sudan Petroleum Company Ltd. (Sudapet), 5%]	Block 1, El Toor, Tooma South, and Unity Fields; Block 1A, Khairat and Munga Fields; Block 2, Grand Heglig Field (Barki, Hamra, Heglig, Kanga Laloba, Rihan, and Toma Fields); Block 2A, Bamboo and Garaad Fields; Block 4, Diffra Field	120,000.
Do.	do.	Petrodar Consortium [China National Petroleum Corp., (CNPC) 41%; Petronas Carigali Overseas Shd. Bhd., 40%; Sudan Petroleum Company Ltd. (Sudapet), 8%; Gulf Petroleum Company of Qatar, 6%; Al-Thani Group, 5%]	Blocks 3 and 7	3,800.
Do.	do.	China National Petroleum Corp.	Block 6 (Fula Field)	3,650.
Refined	do.	Khartoum Oil Refinery [China National Petroleum Corp. (CNPC), 50%, and Sudan Petroleum Corp., 50%)	Refinery at Jali	33,000.
Do.	do.	Port Sudan Refining Ltd. (Government, 100%)	Refinery at Port Sudan	93 liquefied petroleum gas; gas; 1,014 gasoline; 898 kerosene; 2,499 diesel fuel; 4,154 residual fuel oil; 458 naphtha.
Do.	do.	Government	Refinery at El Obeid	3,700.
Do.	do.	Concorp Ltd.	Refinery at Shajirah	3,700.
Do.	do.	Government	Refinery at Abu Jabra	730.
Steel:				
Crude		Sudan Master Technology	Plant at Giad Industrial City	60,000.
Rebar		do.	do.	150,000.
Galvanized		Sudanese Malaysian Co.	NA	8,000.
Do.		Hafez el Barbary	NA	7,000.

NA Not available.

THE MINERAL INDUSTRY OF SWAZILAND

By Thomas R. Yager

The Kingdom of Swaziland was a landlocked country bordered by South Africa on three sides and by Mozambique to the east. The country was a producer of brick clay, coal, ferrovanadium, gravel, sand, and stone. Asbestos production shut down in 2001 because of a ban on asbestos products in the European Union. In 2004, the mining and quarrying sector accounted for less than 1% of the gross domestic product (GDP). Real output in the mining sector increased by 9% in 2004 (International Monetary Fund, 2006, p. 17).

Xstrata plc of Switzerland opened a ferrovanadium plant at Maloma in 2003 with a capacity of 2,400 metric tons per year (t/yr). Production of ferrovanadium at the plant declined to 345 metric tons (t) in 2005 from 1,150 t in 2004 (Xstrata plc, 2006, p. 79).

Maloma Colliery Ltd. (Xstrata plc, 75%, and Tibiyo Taka Ngwane of Swaziland, 25%) operated the Maloma Mine and colliery plant. In 2005, coal production declined to 221,701 t from 488,314 t in 2004; the value of coal production amounted to $7.48 million (Phumzile S. Tsabedze, Central Statistical Office, written commun., July 7, 2006). Coal not used at the ferrovanadium plant was exported to South Africa for use in Xstrata's ferrochromium plants.

In 2005, production of quarried stone increased to 566,771 cubic meters from 230,062 cubic meters in 2004. The value of stone quarried in 2005 amounted to $2.41 million. Fortis Enterprises Ltd. produced bricks; the company was expanding its capacity to 200,000 bricks per day (Colin le Roux, Fortis Enterprises Ltd., written commun., June 29, 2005; Phumzile S. Tsabedze, Central Statistical Office, written commun., July 7, 2006).

Swaziland was dependent upon imports of petroleum products and electricity to meet its energy requirements. From 2000 to 2004, domestic production of electricity fell to 103.5 gigawatthours (GWh) from 264.7 GWh, and imports from South Africa increased to 916.8 GWh from 547.4 GWh (International Monetary Fund, 2006, p. 25).

The outlook for Swaziland's mineral industry was for little change in the near future. The low level of exploration was likely to constrain increases in production. More than 38% of the adult population was estimated to test positive for HIV/AIDS; high rates of HIV/AIDS infection were likely to constrain development of the mining sector (World Bank Group, 2005§[1]).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1

SWAZILAND: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005
Asbestos, chrysotile fiber		3,058 [r]	--	--	--	--
Coal, anthracite		94,431 [r]	553,422	448,664 [r]	488,314 [r]	221,701
Ferrovanadium		--	--	1,011	1,150	345
Stone, quarry products	cubic meters	49,941 [r]	283,175 [r]	324,129 [r]	230,062 [r]	566,771

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through October 4, 2006.

[2] Reported data are from Central Bank of Swaziland, company reports, or the Swaziland Geological Survey and Mines Department.

[3] In addition to the commodities listed, modest quantities of crude construction materials (brick clay and sand and gravel), kaolin, pyrophyllite (talc), and soapstone are produced, but output is not reported quantitatively, and information is inadequate to make estimates of output.

THE MINERAL INDUSTRY OF TANZANIA

By Thomas R. Yager

In recent years, the mineral industry of Tanzania has produced copper, gold, silver, and rolled steel products, and such industrial minerals as calcite, diamond and other gemstones, gypsum, phosphate rock, and salt. The country has also produced coal, natural gas, and such building materials as cement, gravel, limestone, pozzolanic materials, and sand. Deposits of cobalt, iron ore, nickel, and titanium are also known to occur in Tanzania.

In 2005, Tanzania's nominal gross domestic product (GDP) based on purchasing power parity amounted to $27.1 billion; the per capita GDP was about $700. The real GDP grew by 6.9% in 2005 compared with 6.7% in 2004. Manufacturing accounted for 9% of the GDP; construction, 4.8%; mining and quarrying, 3.5%; and electricity and water, 1.6% (Bank of Tanzania, 2006a, p. 29, 31; International Monetary Fund, 2006, p. 184; 2006§[1]).

The value of output in the mining sector grew by nearly 16% in 2005 after rising by 15% in 2004. From 2000 to 2005, the value of output in the mining sector grew by an average of 16% per year because of substantial increases in gold production (table 1). During the same period, the value of output in the construction and electricity and water sectors rose by an average of 12% and 4% per year, respectively (Bank of Tanzania, 2006a, p. 31).

Trade

Tanzania's mineral exports have risen substantially since 2000. Most of the increase was attributable to gold exports, which increased in value to $642 million in 2005 from $629 million in 2004 and $121 million in 2000. From 2000 to 2005, diamond exports declined to $19.7 million from $46 million. Exports of other minerals, which included copper, gemstones, and silver, increased to $31.4 million in 2005 from $18.5 million in 2000. The share of minerals in total exports was 45% in 2005 (Kafumu, 2005; Bank of Tanzania, 2006b, p. 20).

The Bank of Tanzania (2006b, p. 21) reported that imports of petroleum products increased in value to $511 million in 2005 from $432 million in 2004, and imports of fertilizers, to $64.6 million from $54.1 million. Petroleum products accounted for 19% of total imports, and fertilizers, 2%.

Commodity Review

Metals

Cobalt, Copper, and Nickel.—Kahama Mining Corp. Ltd. (KMC) (100% owned by Barrick Gold Corp. of Canada) produced copper as a coproduct at the Bulyanhulu gold mine. In April 2005, Barrick (50%) and Falconbridge Ltd. of Canada (50%) formed a joint venture for the exploration and development of the Kabanga nickel sulfide deposit in northwestern Tanzania. In 2004, resources at Kabanga were estimated to be 26.4 million metric tons (Mt) at a grade of 2.6% nickel; Barrick and Falconbridge planned to complete field work for a new resource estimate in 2006. Falconbridge planned to spend $50 million on exploration to update the resource model and bring the project to feasibility before making a decision on whether to proceed with development (Barrick Gold Corp., 2006a, p. 49).

Goldstream Mining NL of Australia explored for cobalt, copper, and nickel at the Mibango project near Lake Tanganyika and at the Luwumbu project near Lake Malawi in 2004. The company had joint-venture agreements with Lonmin plc of the United Kingdom for these projects. In April 2005, Goldstream announced that nickel laterite resources at Mibango were estimated to be 113.1 Mt at grades of 0.82% nickel and 0.05% cobalt. In July, Goldstream obtained a new property prospective for nickel near Nachingwa in southeastern Tanzania (Goldstream Mining NL, 2005, p. 10, 16).

In 2005, Albidon Ltd. of Australia and BHP Billiton Ltd. of Australia explored at the former company's Songea nickel-platinum project, which comprised five prospecting licenses in southwestern Tanzania. Further exploration was planned for 2006 (Albidon Ltd., 2006).

Gold.—Tanzania's gold production increased to 52,236 kilograms (kg) in 2005 from 48,178 kg (revised) in 2004. Tanzania became the third ranked gold producer in Africa in 2003. The Buhemba, the Bulyanhulu, the Geita, the Golden Pride, the North Mara, and the Tulawaka Mines had a combined capacity to produce about 61,000 kilograms per year (kg/yr) of gold. Tanzania's resources amounted to nearly 1,400 metric tons (t) of contained gold, of which about 840 t were reserves (tables 1, 2, and 3).

Geita Gold Mining Ltd. (a subsidiary of AngloGold Ashanti Ltd. of South Africa) operated the Geita open pit gold mine. The Geita mine produced nearly 19,100 kg of gold in 2005 compared with about 21,500 kg of gold in 2004; the decrease in production was mostly attributable to lower ore grades. Cash costs increased to $298 per troy ounce of gold in 2005 from $250 per troy ounce of gold in 2004 because of lower production and higher contractor and diesel costs. In 2006, production at Geita was expected to decline to between 17,500 kg and 18,200 kg at a cash cost of between $297 and $309 per troy ounce of gold. By 2007, production was expected to increase to about 25,000 kg/yr because of the mining of higher-grade ore from Nyankanga Cut 4 (AngloGold Ashanti Ltd., 2006, p. 42, 74-75; Moore, 2006).

AngloGold Ashanti's exploration activities at Geita were focused on Nyamulilima Hill in 2005. The company signed a joint-venture agreement with Draig Mineral Developments Limited to explore at Mkurumu. AngloGold Ashanti also had a joint-venture agreement with Tan Range Exploration Corp. of Canada for the Kigosi North property (AngloGold Ashanti Ltd., 2006, p. 82).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

KMC operated the Bulyanhulu underground gold mine. In 2005, the Bulyanhulu Mine produced nearly 9,700 kg of gold from nearly 1.05 Mt of ore compared with 10,900 kg of gold from 1.12 Mt of ore in 2004. Recovery rates from 2004 to 2005 remained relatively unchanged at more than 88%. Cash costs were $358 per troy ounce of gold in 2005. The decline in production was attributable to lower ore grades and mechanical difficulties (Barrick Gold Corp., 2006a, p. 27, 48; 2006b, p. 88). KMC also produced copper and silver as coproducts. The majority of gold was recovered from copper concentrates; the remainder was from gold doré.

Barrick and its joint-venture partner Explorations Minières du Nord Ltée (MDN) of Canada started production at the Tulawaka open pit gold mine in 2005. Production at Tulawaka amounted to nearly 3,900 kg of gold from 322,000 t of ore. The recovery rate was nearly 96%. Cash costs were $253 per troy ounce of gold (Barrick Gold Corp., 2006b, p. 88).

Barrick completed a prefeasibility study on mining the Buzwagi deposit (formerly known as Chocolate Reef) in 2005. The company reported that resources at Buzwagi amounted to 58 Mt at a grade of 1.7 grams per metric ton (g/t) gold, of which 39.2 Mt at a grade of 1.9 g/t gold was reserves. Barrick initiated a feasibility study on Buzwagi that was expected to be completed in 2006. Exploration was carried out at the Nyanzaga deposit, which is located northeast of Bulyanhulu, with joint-venture partner Sub-Sahara Resources NL of Australia. Barrick planned to conduct a drilling program at Nyanzaga in 2006 (African Mining, 2005a; Barrick Gold Corp., 2006a, p. 24, 49).

Resolute Mining Ltd. of Australia owned the Golden Pride open pit mine. In 2005, the Golden Pride Mine produced 4,723 kg of gold from 3.2 Mt of ore compared with 4,781 kg of gold from 2.88 Mt of ore in 2004. Gold recovery rates averaged more than 95% in 2005. Lower production was attributable to a decrease in ore grades. Resolute was studying the possibility of expanding the pit to include an additional 31 t of contained gold resources; the study was expected to be completed in the first quarter of 2006. These resources were previously considered to be subeconomic; higher gold prices could convert them to reserves depending on the outcome of the study (Resolute Mining Ltd., 2004; 2005a, b; 2006).

Resolute explored at the Matinje and the Matinje West properties, which are located 30 kilometers (km) to the east of Golden Pride, and at Mwashimba. The company also explored at the Mkweni project, for which it had a joint-venture agreement with Sub-Sahara Resources. Resolute conducted exploration at the Nyakafuru project, which was a joint venture with Gallery Gold Ltd. of Australia, and at Kakumbi, which was a joint venture with African Eagle Resources plc of the United Kingdom (Resolute Mining Ltd., 2006).

Placer Dome Gold Inc. of Canada operated the North Mara open pit gold mine, which started production during the third quarter of 2002. The North Mara project encompassed the Gokona, the Nyabigena, and the Nyabirama pits. In 2005, Placer Dome produced 7,788 kg of gold from 2.98 Mt of ore compared with 6,485 kg of gold from 2.13 Mt of ore in 2004. Production increased because of the expansion of the ore treatment plant that was completed in the fourth quarter of 2004. Cash costs increased to $303 per troy ounce of gold in 2005 from $230 per troy ounce of gold in 2004, and the recovery rate declined to 88.5% from 92%. In December 2005, Placer Dome's board of directors approved a bid by Barrick to purchase the company (Placer Dome Gold Inc., 2006, p. 3, 5).

In February 2003, the state-owned company Meremeta Ltd. started production at the open pit Buhemba Mine near Musoma. In 2005, Meremeta produced 2,075 kg of gold at a cash cost of $384 per troy ounce of gold (Moore, 2006). Meremeta also held the Kilamongo and the Mwizi deposits, which are located south of Buhemba, and the Nyasanero deposit.

Gallery held the Buckreef/Rwamagaza and the Kitongo deposits. The company was engaged in a feasibility study of the Buckreef project. If the study were to yield favorable results, Gallery planned to start construction of open pit mines at Buckreef and Busolwa and an underground mine at Buckreef in the third quarter of 2006. Production was expected to start in mid-2007; the mines were expected to produce nearly 4,400 kg/yr of gold. Resources at Buckreef amounted to nearly 58 t of contained gold (Gallery Gold Ltd., 2005). In December 2005, Gallery's board of directors approved a bid by Iamgold Corp. of Canada to purchase the company.

In 2005, Shanta Gold Ltd. focused its exploration work at the Singida project in central Tanzania. The company relinquished 13 of the 24 prospecting licenses that it held in the Singida area. Shanta also explored for gold at the Katario and the Simba Nguru projects; exploration was terminated at the Ikungu and the Suguti projects in the Musoma greenstone belt because of a lack of substantial gold occurrences. Shanta planned to spend $8 million on exploration at Singida in 2006. The company planned drilling to establish open pit resources at the Mgusu deposit before beginning the Singida exploration program. Resources at Mgusu were estimated to be 6.2 Mt at a grade of 3.7 g/t gold (Shanta Gold Ltd., 2006, p. 6-9).

Tan Range Exploration Corp. of the United States held 141 prospecting licenses in the Lake Victoria goldfield in 2005. The company engaged in exploration for gold at its Kibara, Luhala, and Shinyanga projects. Tan Range also had joint-venture agreements with MDN for the Biharamulu and the Tulawaka projects; MDN explored for gold at a property near the Tulawaka Mine in 2005. Barrick returned the Itetemia and the Katente properties to Tan Range in 2005 because of the incompatibility of their ores with the processing plant at the Bulyanhulu Mine (Tan Range Exploration Corp., 2005, p. 5, 8-9).

In 2005, Sub-Sahara Resources explored for gold at its Lake Victoria project with its joint-venture partner Currie Rose Resources of Canada. Randgold Resources Ltd. of the Channel Islands explored at its properties in the Mara and the Musoma greenstone belts. The company was granted an exploration permit for the Buhemba South property that surrounded the Buhemba Mine (African Mining, 2005a, b). African Eagle explored at Miyabi to increase resources. Midlands Minerals Corp. of Canada explored for gold at its Itilima property in the Lake Victoria goldfield. Lakota Resources Inc. of Canada explored at its Kunga, Simba, and Tanuk projects.

Gold was also produced by small-scale and artisanal miners. In December 2005, Mwananchi Gold Company Ltd. of Tanzania inaugurated the country's first gold refinery in Dar es Salaam.

The company planned to purchase gold from small-scale and artisanal miners and to add value to Tanzania's gold exports (Kisembo, 2005).

Iron and Steel.—National production of rolled steel was 47,652 t in 2005 compared with 40,029 t in 2004 and 11,182 t in 2000. Aluminium Africa Ltd. (ALAF) produced nearly 45,000 t of cold-rolled steel, most of which was consumed in the company's galvanizing plant. The company also exported about 12,000 t to Uganda. Domestic demand for galvanized steel roofing sheets amounted to about 50,000 t in 2005; ALAF supplied nearly 27,000 t to the Tanzanian market and exported about 3,000 t to Angola, Burundi, Congo (Kinshasa), Rwanda, Uganda, and Zambia. MM Integrated Steel Mills Ltd. remelted scrap steel for use in its rolling mill; the company produced steel bars and pipes (Mabati News, 2005; Bank of Tanzania, 2006a, p. 38).

Platinum-Group Metals.—Goldstream Mining NL explored for platinum group metals (PGM) at the Mibango project near Lake Tanganyika and at the Luwumbu project near Lake Malawi. Goldstream's joint-venture partner Lonmin plc of the United Kingdom planned to spend $2.4 million on exploration at Mibango in the 2005-06 field season; exploration was expected to focus on PGM-rich nickel sulfides. Lonmin also planned to spend $850,000 at the Luwumbu project (Goldstream Mining NL, 2005, p. 6, 10, 15).

Sub-Sahara Resources and Canyon Resources Ltd. of Tanzania explored at the Western Areas Joint Venture project in 2005. Through this project, the companies would prospect for copper, nickel, PGM, and uranium on properties that covered 16,000 square kilometers in western Tanzania (African Mining, 2005a).

Silver.—Tanzania produced silver as a coproduct of gold mining and refining. Domestic output of silver decreased to 12,891 kg in 2005 from 13,216 kg in 2004 (table 1). The Bulyanhulu Mine produced concentrates that contained copper, gold, and silver; the recovery rate for silver was 65%. Contained silver resources at Bulyanhulu were estimated to be about 310 t, of which nearly 260 t was reserves (Barrick Gold Corp., 2006a, p. 129).

Coeur d'Alene Mines Corp. of the United States was awarded 10 prospecting licenses for gold and silver in the Lake Victoria goldfield in 2004; the company acquired the Sargurwa property, which is located to the northwest of its Geita 2 property. Preliminary exploration work started in 2005; the company planned to spend about $800,000 on exploration in 2006 (Coeur d'Alene Mines Corp., 2006, p. 32).

Industrial Minerals

Cement.—In 2005, Tanzania's cement production increased to nearly 1.38 Mt from 1.28 Mt in 2004 and 833,000 t in 2000 because of demand from gold mine development, infrastructure works, and large construction projects. National cement capacity amounted to about 1.42 million metric tons per year (Mt/yr). Tanzania's three cement producers were Mbeya Cement Co. Ltd., Tanga Cement Co. Ltd., and Tanzanian Portland Cement Co. Ltd.; these companies used gypsum mined at Makanya in the Mwanga District as raw material (Bank of Tanzania, 2006a, p. 38).

Diamond.—In 2005, national diamond production declined to 219,600 carats from 303,920 carats and 354,400 carats in 2000. Diamond exports declined to $19.7 million in 2005 from $26 million in 2004. The Williamson Mine, which was operated by DeBeers Group, accounted for the majority of Tanzania's diamond production. Artisanal miners mined alluvial deposits near the Williamson Mine (Bank of Tanzania, 2006a, p. 41; 2006b, p. 20).

Diamond recovery at the Williamson Mine decreased to 190,384 carats in 2005 from 285,778 carats in 2004. The grade of ore processed declined to 5.6 carats per 100 metric tons in 2005 from 8.4 carats per 100 metric tons in 2004. In June 2005, DeBeers approved a prefeasibility study on building a new plant that would increase ore treatment capacity to 16 Mt/yr from about 4 Mt/yr. Diamond production was expected to increase to 1 million carats per year. DeBeers planned to complete the study by May 2006 at a cost of $1.7 million. If the prefeasibility study were to yield favorable results, the company planned to finish a full feasibility study by the end of September 2006. Depending upon favorable results of the full feasibility study, DeBeers planned to complete the new plant by December 2008 (DeBeers Group, 2006, p. 73, 88). The entire output of the mine was exported to the United Kingdom.

In January 2004, El Hillal Minerals Ltd. of Tanzania started pilot mining at Mwadui near the Williamson Mine. From February to December 2005, the company produced 12,875 carats of diamond at a value of $2.87 million (East African, 2006).

Tan Range Exploration Corp. discovered 11 kimberlites on its properties in 2005 that included the Igunga project south of the Williamson Mine and the Nzega project southeast of the Buzwagi gold deposit. The company also explored for diamond at the Mwadui project near the Williamson Mine (Tan Range Exploration Corp., 2005, p. 5). Midlands Minerals Corp. of Canada explored for diamond at its Itilima property in the Lake Victoria goldfield.

Gemstones.—Tanzania produced a variety of gemstones that included amethyst, aquamarine, cordierite, emerald, garnet, ruby, sapphire, spinel, tanzanite, and tourmaline. In 2005, the total production of gemstones was nearly 1,940,000 kg compared with 1,610,000 kg in 2004 and 150,000 kg in 2000.

Merelani, which is near Arusha, was the world's only source of tanzanite. In Blocks B and D of the Merelani deposit, artisanal and small-scale miners accounted for most of the country's tanzanite production. Tanzanite Africa Ltd. operated a larger-scale mine in the Block D Extension. Kilimanjaro Mines Ltd. mined tanzanite in Block A. Tanzanite prices increased sharply in 2004 and 2005 because of decreases in production. The increasing depths of tanzanite mines led to higher production costs and a need for greater investment in equipment. Lower grades of tanzanite exacerbated these problems. By mid-2005, production shut down at 180 of the 430 plots in Blocks B and D because of a lack of funds (Kondo, 2005).

TanzaniteOne Ltd. of South Africa held the rights to mine for tanzanite in Block C; the company cut high-quality tanzanite at its lapidaries in South Africa and Tanzania. In 2005, TanzaniteOne produced 280 kg of rough tanzanite. Ore grades were 55 carats per metric ton in 2005 compared with 49 carats per metric ton in 2004; the volume of ore processed also increased. TanzaniteOne started exploration for tanzanite at greater depths on Block C and on adjacent properties in 2005. Resources in Block C were estimated to be between 12,600 kg and 16,600 kg of tanzanite contained in between 950,000 t and 1.26 Mt of ore. In August 2005, TanzaniteOne approved Color Jewels Inc., K.L. Tambi & Co., Rare Multicolor Gems Inc., STS Jewels Inc., Tanzanite International, and Tanzanite Company as sightholders, which are preferred customers (TanzaniteOne Ltd., 2004; 2006, p. 9-11, 22).

India performed about 80% of the world's cutting and polishing of tanzanite. In July 2003, the Tanzanian Government proposed a ban on the export of all rough tanzanite by 2005. This proposal was designed to encourage the growth of the Tanzanian lapidary industry. At the end of 2005, the Government had not taken action on the proposed ban (TanzaniteOne Ltd., 2004; Ihucha, 2006).

Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was mined from alluvial and primary deposits at Lemshuko. Mechanized mining operations were under development in late 2005. Rhodolite garnet was produced from mines located a few km south of Lemshuko and in the Umba Valley. Almandine garnet was also produced in the Umba Valley; large-scale mining operations were reportedly planned for the near future (Austin and others, 2005; Henricus, 2005).

Ruby production increased at the Losongonoi Mines, which are located southeast of Arusha; foreign and local investors started large-scale mining there for the first time. In the Umba Valley, the production of ruby, sapphire, and other gemstones declined because of the depth of the mines and the lack of modern mining equipment. The production of ruby, sapphire, and other gemstones declined in the Tunduru District in the Ruvuma Region because of the depletion of alluvial deposits. Mechanized ruby and sapphire mining was carried out by Tansta Mining Co. and World Gem Supplies Ltd. in the Songea District in the Ruvuma Region; artisanal miners also worked at these deposits. Ruby was also produced at the Longido Mine in the Monduli District and at the Naende Mines in the Rukwa Region (Austin and others, 2005).

Artisanal and small-scale miners produced alexandrite and emerald sporadically at the Manghola and the Manyara deposits in the Manyara District. The Manghola deposit was alluvial. In January 2005, the Government issued 10 mining licenses for Manghola. By mid-2005, Paradiso Minerals (T) Ltd. was setting up a mechanized mining operation. Production was inhibited by the remoteness of the deposits. Alexandrite was also produced in the Tunduru District, and emerald, in the Sumbawanga District (Kondo, 2005).

Aquamarine was mined at Kalunga in the Nkasi District; moonstone, in the Dodoma and Morogoro Regions; spinel, in the Mahenge Region in south-central Tanzania and at in the Tunduru District; and tourmaline, at the Manghola deposit and in the Umba Valley.

Mineral Fuels

Coal.—The Kiriwa coalfield produced a small amount of bituminous coal, most of which was consumed at a powerplant near the mine. Bituminous coal deposits in the Ruhuhu coalfield included the Ketewaka, the Mbalawala, the Mbuyura, and the Mchuchuma; other bituminous coalfields included the Gahula and the Njuga.

The state-owned National Development Corp. (NDC) formed a joint venture with Grinaker-LTA and Siemens Ltd. to develop the Mchuchuma coal deposit, which had estimated resources of 585 Mt. NDC planned to build a surface mine with a capacity of 1.5 Mt/yr and a coal-fired powerplant with a capacity of 400 megawatts (MW). The cost for the project was estimated to be $600 million; development depended upon Government approval of the project verification documents submitted in March 2004. The Government had not approved the documents at the end of 2005. In 2005, the state-owned utility Tanzania Electric Supply Company Ltd. (TANESCO) decided to postpone competitive bidding on the development of the new power station because of the availability of natural gas from Songo Songo Island (Mwamunyange, 2006).

Natural Gas.—In July 2004, EastCoast Energy Corp. started the production of natural gas from Songo Songo Island. In 2005, the company increased production to 408 million cubic meters of natural gas from 119 million cubic meters in 2004. The Ubungo power station in Dar es Salaam consumed 292 million cubic meters of Songo Songo's production, and the Wazo Hill cement plant operated by TPCC, 45 million cubic meters. Industrial consumers that included ALAF and Kioo Ltd. accounted for 22 million cubic meters. Reserves were estimated to be 16 billion cubic meters at the end of 2005 (EastCoast Energy Corp., 2006, p. 2-3, 7).

TANESCO planned to build new gas-fired powerplants to meet increased demand for natural gas. Demand was expected to increase by 440 million cubic meters per year by 2008 and 890 million cubic meters per year by 2010. By the end of May 2006, a study on increasing the capacity of EastCoast's gas-processing plant to more than 1.2 billion cubic meters per year from 720 million cubic meters per year was expected to be completed. Production would be limited by the capacity of the pipeline to about 1.1 billion cubic meters per year. EastCoast also planned to drill at least one well on the Songo Songo West property in 2006 or 2007 and to make a decision on whether to drill a well on the Nyuni A property by September 2006 (EastCoast Energy, 2006, p. 3, 5, 16).

In December 2005, Artumas Group Inc. of Canada received an environmental impact assessment certificate from the Government for development of the Mtwara energy project. This project involved the development of natural gas resources in Mnazi Bay, which is located in southeastern Tanzania. Artumas planned to complete a gas-processing plant with a capacity of about 100 million cubic feet per year and a 27-km pipeline in the second quarter of 2006 and a 12-MW powerplant at Mtwara in the third quarter of 2006. In the second half of 2006, the company planned to begin the expansion of the Mtwara plant to 24 MW and to upgrade the local power transmission and distribution system. Mnazi Bay had estimated reserves of 31 billion cubic meters (Artumas Group Inc., 2006, p. 3, 10).

Petroleum.—Tanzania's only refinery was shut down in 2000 because of its outdated technology and high transportation costs; the country has since depended on imported petroleum products to meet its petroleum requirements. In October 2005, Aminex plc of the United Kingdom signed a production-sharing agreement with the Government for an area in the Ruvuma Basin in southern Tanzania. Energulf Resources Inc. of Canada signed an agreement with JEBCO Seismic Ltd. of the United Kingdom to explore at the Tanga Block (Aminex plc, 2005; Energulf Resources Inc., 2005). Petrobras Group of Brazil held Block 5 in the Mafia Basin; the company won the concession for Block 6 in May 2005. Ophir Energy Company Ltd. of South Africa won the concession for Block 1 in May; the company signed a production-sharing agreement with the Government for Block 1 in October. Maurel et Prom of France also held an exploration license.

Uranium.—In August 2005, Goldstream announced plans to form Uranex NL to hold its uranium exploration assets. Goldstream planned to make an initial public offering of 50% of the shares in Uranex and would retain the remaining 50% of the shares. Uranex planned to spend $2.4 million during a period of 2 years on exploration at its properties in Tanzania. Expenditures at Bahi in central Tanzania were expected to be about $960,000; at Mkuju in the southern part of the country, about $600,000; at Ambussel in the northeast, about $360,000; and at other areas of the country, $480,000 (Goldstream Mining NL, 2005, p. 4, 29-31, 34).

Infrastructure

TANESCO had powerplants with a combined capacity of 851 MW in its grid network, of which 561 MW was hydroelectric and 290 MW was thermal. Hydroelectric power stations included Kidatu, with a capacity of 204 MW; Kihansi, 180 MW; Mtera, 80 MW; Pangani Falls, 68 MW; Hale, 21 MW; and others, 8 MW. The Ubungo thermal plant had a capacity of 190 MW and, Tegeta, 100 MW. The Tegeta plant, which used heavy fuel oil, was owned and operated by Independent Power Tanzania Ltd.; the Government planned to convert Tegeta to a gas-fired plant. By December 2005, low rainfall reduced the effective capacity at Kidatu and Mtera to 100 MW and 30 MW, respectively (EastCoast Energy Corp., 2006, p. 20). In addition to the plants in the grid network, isolated mini-hydroelectric generators supplied small amounts of output; isolated diesel generators supplied power to gold mines.

TANESCO planned several new projects to alleviate shortfalls in hydropower supply and to meet expected increases in demand. The company planned to install a gas-fired plant with a capacity of 200 MW in Dar es Salaam by the end of 2006. The Mtwara plant was expected to replace diesel-fired plants at Lindi, Masasi, and Mtwara in 2006. An expansion of the Tegeta plant's capacity by 45 MW was planned for January 2007. TANESCO also planned to build a new gas-fired plant at Kinyerzi in Dar es Salaam with a capacity of 250 MW by 2010 (Artumas Group Inc., 2006, p. 10; EastCoast Energy Corp., 2006, p. 20-21).

Outlook

Tanzania's mineral industry, particularly gold mining, is likely to grow in the near future. With increased production from the Geita Mine and the development of such projects as Buckreef, Tanzania's gold production could rise to about 59 t in 2007 followed by a slight decrease to 58 t in 2009. Diamond production could increase to more than 1 million carats in 2009. Natural gas production is expected to increase. Artisanal tanzanite production is likely to fall because of resource depletion; to what extent increased production by TanzaniteOne will offset the decline is unclear. The development of nickel and PGM resources depends heavily upon world market conditions. The International Monetary Fund (2006, p. 184) predicted that Tanzania's GDP would grow by 5.8% in 2006 and 7% in 2007. If similar rates of growth happen in the construction industry, the production of construction materials, such as brick clay, gypsum, limestone, and sand and gravel, could increase substantially.

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TABLE 1
TANZANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
Calcite[e]		40	40	40	40	40
Cement, hydraulic	thousand metric tons	900	1,026	1,186	1,281	1,375
Coal, bituminous		77,789	79,210	54,610	65,041	74,800
Copper, contained in concentrates and doré		2,645	4,222 [r]	3,715 [r]	4,240 [r]	3,462
Diamond[3]	carats	254,271	239,761	236,582	303,920	219,600
Gemstones, excluding diamond:[4]						
Amethyst[e]	kilograms	277 [5]	270	270	280	340
Aquamarine	do.	454	600 [e]	278	290 [e]	350 [e]
Cordierite (iolite)[e]	do.	312 [5]	310	310	330	400
Garnet	do.	19,508	13,000 [e]	5,911	6,200 [e]	7,400 [e]
Ruby	do.	1,174	1,800 [e]	2,675	2,800 [e]	3,400 [e]
Sapphire	do.	3,576	2,400 [e]	1,338	1,400 [e]	1,700 [e]
Tanzanite	do.	5,473	6,461	4,490	3,100 [r, e]	3,100 [e]
Other[e]	do.	66,092 [5]	171,000	1,520,000	1,600,000	1,920,000
Total	do.	96,866	196,000	1,540,000	1,610,000	1,940,000
Gold	do.	30,088	43,320	48,018	48,178 [r]	52,236
Gypsum and anhydrite, crude		72,000	73,000	33,232	59,231 [r]	63,377
Natural gas	million cubic meters	--	--	--	119	408
Phosphate minerals:						
Apatite		4,000	1,182	3,738	6,570	7,096
P_2O_5 content		1,200	350	1,100	1,300 [r]	1,300
Salt, all types		65,000	71,200	58,978	57,062 [r]	135,410
Silver, contained in concentrates and doré	kilograms	6,861	7,669	7,986	13,216 [r]	12,891
Steel, semimanufactured		16,340	25,418	38,794 [r]	40,029	47,652
Stone, sand, and gravel:						
Aggregates		NA	20,223	107,960	120,000 [e]	140,000 [e]
Dolomite		NA	NA	2,197	2,500 [e]	2,900 [e]
Limestone, crushed		2,269,359	2,856,711	1,206,000	1,390,900	2,780,000
Pozzolanic materials		41,468	52,000	105,910	152,679	163,499
Sand		NA	503,485	2,035,960	2,400,000 [e]	2,800,000 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through October 24, 2006.

[2] In addition to the commodities listed, modest quantities of lime, silica sand, and crude construction materials, including brick clay, are produced, but available information is inadequate to make estimates of output.

[3] Diamond figures are estimated to represent 85% gem-quality or semigem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production.

[4] Other precious and semiprecious stones produced include alexandrite, chrysoprase, emerald, kyanite, moonstone, opal, peridot, quartz, spinel, and tourmaline. Does not include smuggled artisanal production.

[5] Reported figure.

TABLE 2
TANZANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tanzania Portland Cement Co. Ltd. (HeidelbergCement AG, 69.3%)	Plant at Wazo Hill	670,000 cement; 510,000 clinker.
Do.		Tanga Cement Co. Ltd. (Holcim South Africa (Pty) Ltd., 62.5%)	Plant at Tanga	500,000 cement; 500,000 clinker.
Do.		Mbeya Cement Co. Ltd. (LaFarge Group, 58%).	Plant at Mbeya	250,000 cement; 250,000 clinker.
Coal, bituminous		Tanzania-China Kiwira Coal and Power (Hunan International Economic and Technical Cooperation Co., 62%, and Government, 38%)	Kiwira Mine	150,000 run of mine; 93,000 washed.
Copper, in concentrates and doré		Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%).	Bulyanhulu Mine near Kahama	5,300.
Diamond		Williamson Diamonds Ltd. (DeBeers Group, 75%, and Government, 25%)	Mwadui Mine near Shinyanga	4,000,000 ore processing.
Do.	carats	do.	do.	250,000 diamond.
Do.	do.	El Hillal Minerals Ltd.	Near Mwadui Mine	24,000.[e]
Glass		Kioo Ltd.	Dar es Salaam	36,000.
Gold		Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	Geita Mine near Nyakabale	6,000,000 ore processing.
Do.	kilograms	do.	do.	25,200 gold.
Do.		Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	1,095,000 ore processing.
Do.	kilograms	do.	do.	14,100 gold.
Do.		Placer Dome Gold Inc.	North Mara Mine in Tarime District	2,800,000 ore processing.
Do.	kilograms	do.	do.	9,800 gold.
Do.		Resolute Mining Ltd.	Golden Pride Mine near Isanga	2,600,000 ore processing.
Do.	kilograms	do.	do.	4,200 gold.
Do.		Meremeta Ltd. (Government of Tanzania)	Buhemba Mine, 47 km southeast of Musoma	1,200,000 ore processing.
Do.	kilograms	do.	do.	3,300 gold.
Do.		Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	Tulawaka Mine	365,000 ore processing.
Do.	kilograms	do.	do.	4,400 gold.
Lime		Athi River Mining Ltd.	Plant at Tanga	40,000.
Natural gas	million cubic meters	EastCoast Energy Corp.	Gasfield on Songo Songo Island	720.
Petroleum products[1]	thousand 42-gallon barrels	Tanzanian and Italian Petoleum Refining Co. Ltd.	Refinery at Dar es Salaam	5,440.
Phosphate rock		Minjingu Phosphate Co. Ltd.	Mine at Minjingu	30,000.
Silver	kilograms	Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	11,000.
Steel		Aluminum Africa Ltd.	Plant at Dar es Salaam	45,000.[e]
Do.		SITA Rollings Ltd.	do.	14,000 rolled.
Do.		MM Integrated Steel Mills Ltd.	do.	2,000 rolled.
Do.		Aluminum Africa Ltd.	do.	40,000 galvanized.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000 galvanized.
Tanzanite		TanzaniteOne Ltd.	Mine at Merelani, Block C[2]	120,000 ore processing.
Do.	kilograms	do.	do.	1,600 tanzanite.
Do.	do.	Tanzanite Africa Ltd. (IPP Media Ltd.)	Mine at Merelani, Block D Extension	NA.
Do.	do.	Kilimanjaro Mines Ltd.	Mine at Merelani, Block A	NA.
Do.	do.	Small-scale and artisanal miners	Mines at Merelani, Blocks B and D	NA.

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] Shut down in 2000.

[2] Formerly the graphite processing plant at Merelani operated by Phoenix Minerals Ltd.

TABLE 3
TANZANIA: GOLD RESOURCES AND RESERVES IN 2005

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
Reserves:				
Bulyanhulu[1]	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	25.9	12.9	334
Geita[2]	Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	62.4	4.2	264
North Mara[2]	Placer Dome Gold Inc.	38.2	3.5	134
Buzwagi[1, 3]	Kahama Mining Corp. Ltd.	39.2	1.9	74
Golden Pride[2]	Resolute Mining Ltd.	12.3	1.6	20
Tulawaka[1]	Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	1.4	12.1	17
Total		179.4	4.7	843
Resources:				
Geita	Geita Gold Mines	96.2	4.3 [4]	414
Bulyanhulu	Kahama Mining Corp. Ltd.	29.7	13.1 [4]	408
North Mara	Placer Dome Gold Inc.	50.2	3.3	166
Buzwagi[3]	do.	58.0	1.7	100
Golden Ridge	Kahama Mining Corp. Ltd.	49.0	1.4	68
Buckreef/Rwamagaza:	Gallery Gold Ltd.	27.1	2.1	58
Golden Pride	Resolute Mining Ltd.	28.8	1.8	52
Buhemba	Meremeta Ltd. (Government of Tanzania)	11.4	2.0	23
Mgusu	Shanta Gold Ltd.	6.2	3.7	23
Nyakafuru	Gallery Gold Ltd.	3.6	6.3	23
Tulawaka	Barrick Gold Corp., 70%, and Exploration Minières du Nord Ltée, 30%	1.5	11.2	17
Kitongo:				
Main Zone	Gallery Gold Ltd.	10.5	1.4	15
Isegenghe Hill	do.	0.2	14.4	2
Miyabi	African Eagle Resources plc	8.3	1.5	13
Kisunge Hill	Tan Range Exploration Corp.	9.4	1.0	9
Ikungu	Lakota Resources Inc.	2.5	2.3	6
Total		393	3.6	1,397

[1] Definitions of resources and reserves are based on National Instrument 43-101, as required by Canadian securities regulatory authorities.

[2] Definitions of resources and reserves are based on the Australasian Code for the Reporting of Identified Mineral Resources and Ore Reserves issued by the Joint Committee for the Australasian Institute of Geoscientists and the Australian Mining Industry Council.

[3] Formerly known as Chocolate Reef.

[4] Note that, in most cases, the grade of resources is lower than the grade for reserves, but in this case, the grade of the less economic material is higher, leading to the paradox of a higher resource grade.

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THE MINERAL INDUSTRY OF TUNISIA

By Philip M. Mobbs

Tunisia's major contribution to the world mineral supplies was phosphate rock and phosphate-based fertilizers. Tunisia, which is located in North Africa and has a total area of 163,610 square kilometers, was the world's fifth ranked phosphate rock producer and accounted for about 5% of the world supply of phosphate rock. About 80% of Tunisian phosphate rock production was processed locally into fertilizers (such as diammonium phosphate and triple superphosphate) and phosphoric acid. The Tunisian mineral sector posted mixed results in 2005. The planned September closure of the Bougrine lead-zinc mine resulted in a drop in zinc exports, but the resultant slight decline in revenue from zinc exports was offset by increased income from exports of aluminum fluoride, cement, crude oil, iron and steel, phosphate rock, phosphoric acid, and refined petroleum products. The industry also was buoyed by significantly increased production from privately owned marine salt operations that offset the decline in production of the Government salt company and by increased crude oil production from new wells in the Adam oilfield that offset the continued decline from the Ashtart and El Borma Fields (Central Bank of Tunisia, 2006, p. 114, 117, 118, 124, 127; Jasinski, 2006§[1]).

The hydrocarbon sector accounted for about 4% of Tunisia's gross domestic product (GDP) in 2005. The cement, construction materials, glass, and mining sectors accounted for about 2.5% of the GDP, and phosphate-based fertilizer production accounted for nearly 2%. In 2005, the GDP based on purchasing power parity was estimated to be about $83.7 billion.[2] The per capita GDP based on purchasing power parity was $8,255 (Central Bank of Tunisia, 2006, p. 57; International Monetary Fund, 2006§).

Other mineral or processed mineral commodities produced in Tunisia included clay, gypsum, iron ore, lead, lime, salt, and silver. Mineral exploration and production were licensed by the Government according to the Mining Code (law No. 2003-30 of April 28, 2003). The Hydrocarbon Code (law No. 99-93 of August 17, 1999) regulated offshore and onshore natural gas and oil exploration and production.

Commodity Review

Metals

Copper, Gold, Lead, and Zinc.—The closure of the Bougrine lead-zinc mine in 2005 followed the closure of the Fej Lahdoum lead-zinc mine in May 2004 and the Boujabeur barite-lead-zinc mine in July 2004. All three mines were closed after reserves were depleted (Central Bank of Tunisia, 2005, p. 57; 2006, p. 57).

In 2005, Breakwater Tunisia S.A. (a subsidiary of Breakwater Resources Ltd. of Canada) milled 216,823 metric tons (t) of lead-zinc ore, which was down from 330,392 t in 2004. The Bougrine mill produced 29,142 t of zinc concentrates that contained 15,889 t of zinc. The mill's lead concentrate production increased to 13,373 t that contained 8,708 t of lead compared with 8,399 t of lead concentrates produced in 2004 that contained 5,470 t of lead. Breakwater started reclamation of the mine and tailings dam and pond. The mill was placed on care and maintenance status (Breakwater Resources Ltd., 2006, p. 24).

Metal exploration in Tunisia included Albidon Ltd. of Australia's evaluation of its Nefza exploration permit, which included drilling and geophysical surveys on the Jebel Trozza and the Jebel Touila zinc prospects, and sampling of the Kef El Agueb, the Oued Belif, and the Ras Rajel gold prospects. Maghreb Minerals Plc of the United Kingdom completed a 24-hole 4,497-meter drill program on the Djebba lead-zinc prospect and additional drilling on the Fej Lahdoum, the Koudiat Louatia, and the Ouled Moussa lead-zinc prospects. Maghreb allowed the exploration permit for the Koudiat Sidii prospect to expire (Maghreb Minerals Plc, 2006§).

Albidon and Maghreb were expected to increase their respective exploration activities in 2006. Breakwater proposed to begin a drilling program and geophysical surveys on a lead-zinc prospect that was located 170 kilometers northwest of the mill at Bougrine.

Industrial Minerals

Cement.—In 2005, Grupo PRASA of Spain acquired the Société Tuniso-Algérienne de Ciment Blanc S.A., which was privatized by the Governments of Algeria and Tunisia (each of which had formerly held a 50% interest). Grupo PRASA proposed to expand the 200,000-metric-ton-per-year (t/yr)-capacity white cement plant at Feriana by 2010 (Internet Management Group SA, 2005§).

Mineral Fuels

Natural Gas.—In 2005, Trans-Tunisian Pipeline Co. Ltd (a subsidiary of Eni S.p.A.) agreed to expand the 27-billion-cubic-meter-per-year-capacity Trans-Tunisian Pipeline, which connects the Algerian natural gas pipeline system of la Société Nationale de la Recherche, de la Production, du Transport, du Traitement et de la Commercialisation des Hydrocarbures (Sonatrach) with the Trans-Mediterranean Pipeline that connects Cap Bon, Tunisia, with Mazara del Vallo, Sicily, Italy. An initial 3.2-billion-cubic-meter-per-year-capacity increase of the Trans-Tunisian pipeline was planned to come online in 2008; an additional 3.3-billion-cubic-meter-per-year-capacity expansion

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Where necessary, values have been converted from Tunisian dinars (TD) to U.S. dollars (US$) at an average rate of TD1.31=US$1.00 for 2005 and TD1.29=US$1.00 for 2004.

was planned by 2012, which would give the Tunisian segment a final capacity of 33.5 billion cubic meters per year. Sonatrach agreed to a similar expansion of the Algerian feeder pipelines (Eni S.p.A., 2005).

Petroleum.—The Adam concession, which included the Adam, the Dalia, and the Hawa Fields, became Tunisia's leading crude oil producing center in 2005. Initial production from the Adam concession had begun in 2003. In 2005, crude oil production from El Borma Field, which had been the leading producing oilfield, declined by 10.3% compared with that of 2004 and 31.5% compared with that of 2001. Production from the Ashtart Field declined by 8.1% in 2005 compared with that of 2004 and by 22.2% compared with that of 2001 (Central Bank of Tunisia, 2006, p. 61).

In 2005, the Government proposed to build a second crude oil refinery in Tunisia. The new 120,000-barrel-per-day-capacity facility, which was to be located at La Skhira, would increase the locally-produced refined petroleum supply that was currently (2005) being produced by a 34,000-bbl/d-capacity refinery at Bizerte. State-owned Société Tunisienne des Industries du Raffinage planned to award a 30-year build-own-operate concession for the new refinery in 2007; initial production was expected by 2010 (Middle East Economic Digest, 2006).

Outlook

The mineral and energy sectors, which accounted for about 17% of exports and more than 8% of the GDP, are integral parts of Tunisia's economic future. Metal deposits in northern Tunisia are expected to continue to attract junior exploration companies. The hydrocarbon resources of Tunisia, which were small relative to the other oil-producing nations of North Africa, are expected to continue to attract independent oil companies.

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Major Sources of Information

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TABLE 1
TUNISIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005[p]
METALS						
Iron and steel:						
Iron ore:						
Direct shipping ore and concentrate, gross weight		204	198	164	256 [r]	206
Fe content		109 [e]	105	97	134 [r]	108
Metal:						
Pig iron		192	152	36	--	--
Steel, crude		239	200	86	70	66
Lead, mine output, Pb content	metric tons	6,820 [e]	5,081	5,000	5,470 [r]	8,708
Silver, metal, primary[e]	kilograms	3,650	3,000	3,000	2,400 [r]	1,200
Zinc:						
Concentrate, gross weight	metric tons	73,000	64,890	65,800	52,747	29,412
Zn content	do.	37,900 [e]	35,692	36,000	29,011	15,889
INDUSTRIAL MINERALS						
Barite	metric tons	2,208	5,539	3,000	1,813	--
Cement, hydraulic[3]		5,721	6,022	6,038	6,662 [r]	6,691
Clays, for construction and clay products		4,260	4,400	4,500	5,200 [r]	5,400
Fertilizers:						
Triple superphosphate		783	796	875	868 [r]	848
Phosphoric acid		1,144	1,219	1,164	1,241	1,217
Diammonium phosphate		1,124	1,315	1,324	1,313	1,114
Ammonium nitrate		170	127	164	134 [r]	148
Fluorine, aluminum fluoride		44	39	45	42 [r]	42
Gypsum[e, 4]		125	125	110	108 [r]	113
Lime		467	471	446	476 [r]	424
Phosphate rock, washed, gross weight		8,144	7,461	7,890	8,051 [r]	8,220
Salt, marine		654	616	700	1,117 [r]	1,132
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	2,254	2,149	2,167	2,530	2,585
Dry[e]	do.	1,800	1,700	1,750	2,050	2,100
Petroleum:						
Crude	thousand 42-gallon barrels	26,300	26,800	24,300	25,700	26,200
Refinery products:						
Liquefied petroleum gas	do.	1,180	1,310	1,200	1,250 [r]	1,260
Gasoline	do.	3,690	3,380	3,600	3,450 [r]	1,880
Kerosene	do.	1,560	1,590	1,270	1,310 [r]	1,770
Distillate fuel oil	do.	3,490	3,500	3,780	3,220 [r]	3,630
Residual fuel oil	do.	3,950	4,020	4,050	3,960 [r]	4,030
Other[e]	do.	940	1,120	1,180	660 [r]	1,300
Total[e]	do.	14,800	14,900	15,100	13,900	13,900

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. -- Zero.

[1] Table includes data available through October 4, 2006.

[2] In addition to the commodities listed, a variety of crude construction materials (sand and gravel and stone) was produced, but output was not reported, and available information was inadequate to make estimates of output.

[3] Includes white cement production, in thousand metric tons: 2001--247; 2002--259; 2003--296 (revised); 2004--304; and 2005--333.

[4] Does not include phosphatic gypsum (waste product) generated during fertilizer production.

TABLE 2
TUNISIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aluminum fluoride		Industries Chimiques du Fluor	Ghannouch, near Gabes	42
Cement:				
Portland		Société des Ciment d'Enfidha	Enfidha	2,000
Do.		Société des Ciment de Jbel Oust	Jbel Oust	1,200
Do.		Société des Ciment d'Oum el Kélil	Le Kef	970
Do.		Société des Ciment de Bizerte	Bizerte	840
Do.		Société des Ciments Artificiels Tunisiens	Ben Arous	800
Do.		Société des Ciment de Gabès	Gabes	733
White		Société Tuniso-Algérienne de Ciment Blanc S.A.	Feriana	200
Fertilizer:				
Ammonium nitrate		Group Chimique Tunisienne	Ghannouch, near Gabes	330
Diammonium phosphate		do.	do.	1,000
Triple superphosphate		do.	M'Dhilla	465
Do.		do.	Sfax	330
Iron and steel:				
Iron ore		Société de Djebel Djerissa	Djerissa Mine	175
Do.		do.	Tamera Mine	75
Steel, crude		Société Tunisienne de Sidérurgie	El Fouladh	70
Steel, rolled, bar and rod		Intermetal S.A.	Ben Arous	300
Lead and zinc ore		Breakwater Tunisia S.A.	Bougrine Mine	330
Do.		Compagnie Miniere du Nord Ouest	Fej Lahdoum	50
Petroleum, refined	42-gallon barrels per day	Société Tunisienne des Industries du Raffinage	Bizerte	34,000
Phosphate rock		Compagnie des Phosphates de Gafsa	Kef Eddour Mine	3,200
Do.		do.	Kef Eschfair Mine	3,000
Do.		do.	Jallabia	1,700
Do.		do.	Redeyef Mine	150
Phosphoric acid		Group Chimique Tunisienne	Ghannouch, near Gabes	405
Do.		do.	Skhira	365
Do.		do.	M'Dhilla	183
Do.		do.	Sfax	131
Salt		Compagnie Générale des Salines de Tunisie	Zarzis and Sahline Sousse	750
Do.		SAIDA S.A.	Sebkhet Sidi El Heni, Zeramdine	250

THE MINERAL INDUSTRY OF UGANDA

By Thomas R. Yager

The East African country of Uganda was known to produce cobalt, columbium (niobium) and tantalum, gold, iron ore, steel, tin, and tungsten. Uganda also produced such industrial minerals as gypsum, kaolin and other clays, lime, salt, soapstone, and vermiculite, and such building materials as cement, limestone, and pozzolanic materials (table 1). The country also had resources of copper, phosphate rock, and silica sand.

Uganda's real gross domestic product (GDP) increased by 5.6% in 2005. The nominal GDP based on purchasing power parity was $43.3 billion, and the per capita GDP based on purchasing power parity was about $1,600. In fiscal year 2004-05, construction accounted for 9% of the GDP; manufacturing, 8%; electricity and water, 1%; and mining and quarrying, 1% (Bank of Uganda, undated, p. 146; International Monetary Fund, 2006, p. 184; 2006§[1]).

The mining and quarrying sector grew by 16.9% in fiscal year 2004-05 compared with 5.4% in fiscal year 2003-04. Growth in the mining and quarrying sector was attributable to higher production of cobalt and limestone. The construction sector grew by 12.3%; manufacturing, 6.7%; and electricity and water, 6% (Bank of Uganda, undated, p. 149).

Commodity Review

Metals

Cobalt and Copper.—Kasese Cobalt Company Ltd. (Blue Earth Refineries Ltd., 75%) produced refined cobalt from the Kilembe stockpile. Production increased to 638 metric tons (t) in 2005 from 436 t in 2004; the value of production was $17 million. In 2005, cobalt exports amounted to $15.6 million, or 2% of total exports; cobalt was exported to countries that included China, Japan, and the United States (Bank of Uganda, 2005, 2006; Grace L. Nassuna, Principal Documentation Officer, Department of Geological Survey and Mines, written commun., July 25, 2006).

The Kilembe stockpile resources were estimated to be 515,000 t at a grade of 1.38% cobalt in mid-2005. Blue Earth planned to produce 720 metric tons per year (t/yr) of cobalt; at a recovery rate of 70%, the stockpile was expected to last for nearly 7 years. The company estimated that world market prices of nearly $10 per pound of cobalt were necessary to produce at the rate of 720 t/yr (Blue Earth Refineries Inc., 2006, p. 21, 26).

In 2005, Uganda Gold Mining Ltd. (UGM) of Canada started exploration near the Kilembe copper-cobalt mine. The company could earn a 70% interest in the Kilembe Mine by conducting exploration and completing a feasibility study by January 2007 on restarting production. The mine has not produced since 1977. Resources at the mine were estimated to be 3.15 million metric tons (Mt) at grades of 0.97% copper and 0.18% cobalt, and at the tailings dams, 5.2 Mt at grades of 0.18% copper and 0.12% cobalt (Uganda Gold Mining Ltd., 2004).

Gold.—In 2005, national gold production declined to 46 kilograms (kg) from 1,447 kg in 2004. M/S Busitema Mining Company Ltd. started open pit mining at the Tiira Mine near Busia in 2004. The Tiira Mine had a capacity of between 360 and 420 kilograms per year; production was inhibited by an unstable electricity supply. Busitema estimated that resources from the open pit section of the mine could last for 15 years. Gold production by Kisita Mining Company Ltd. was on hold in 2004 pending the installation of new equipment in March 2005 (African Mining, 2005; Uganda Ministry of Energy and Mineral Development, 2005, p. 46-47).

Canmin Gold Ltd. [a subsidiary of International Business Investments Corp. (IBI)] held the Busia and the Ibanda gold properties in southeastern Uganda near Lake Victoria and the Bugiri property in southwestern Uganda. In 2005, Canmin was awarded a new property adjacent to Bugiri. Glencar Mining plc of Ireland explored for gold at its property near the Tiira Mine.

In 2005, gold exports were $73 million, or 9% of total exports. The majority of gold exports were reported to be reexports from Congo (Kinshasa). In June 2005, Metalor Technologies SA of Switzerland refused to purchase gold from Uganda for use in its refinery because of allegations that gold was illegally mined and exported from Congo (Kinshasa) by Ugandan military officers. The Government denied the allegations (Allio, 2005; Bank of Uganda, 2005, 2006).

Iron and Steel.—The Alam Group operated a small electric-arc furnace that produced steel from remelted scrap. In 2005, the Alam Group increased the capacity of its rolling mill at Jinja to at least 40,000 t/yr from 24,000 t/yr. The expansion was completed in August at a cost of $5 million (Omony and Mugisha, 2005). Sembule Steel Mills Ltd. produced steel bars and coils for use by the company in the production of fencing, nails, and roofing sheets.

Tungsten.—Krone Uganda Ltd. mined tungsten at the Nyamuliro Mine in Kabale district. The company was forced to shut down in late 2004 because of theft from the mine. Production at Nyamuliro had also been inhibited by poor infrastructure. In February 2005, Krone was put under receivership after defaulting on payment of a loan. By July, Krone was involved in a dispute with Development Finance Company of Uganda Bank Ltd. over the rights to the mine; the latter company was accused of illegally mining at Nyamuliro. Reported tungsten production amounted to 36 t in 2005 (Nyanzi, 2005; Uganda Ministry of Energy and Mineral Development, 2005, p. 44).

Industrial Minerals

Cement.—Uganda's cement production rose to 558,988 t in 2004 from 507,068 t in 2003 and 347,274 t in 1999. In 2004,

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Tororo Cement Industries Ltd. completed construction of its new plant, which increased the company's capacity to 394,000 t/yr from 220,000 t/yr (table 2). In 2005, Hima Cement Industries Ltd. was conducting a feasibility study on the expansion of its plant, which had a capacity of 350,000 t/yr. Cement producers faced poor infrastructure and unreliable power supplies (Bank of Uganda, undated, p. 184; Olaki, 2005; Uganda Ministry of Energy and Mineral Development, 2005, p. 45).

Clay and Shale.—Ball clay was mined at Mukono, and brick clay, at Kajansi. Muhindo Enterprises Ltd. planned to start kaolin production in August 2005. The company planned to produce 150,000 t/yr of kaolin at a value of $7.5 million; 50,000 t/yr of metakaolin at a value of $5 million; and 30,000 t/yr of aluminum sulfate at a value of $9 million. By July 2005, Muhindo had invested $6 million in the project; the company planned to triple or quadruple its production in 10 to 15 years. Kaolin was expected to be consumed domestically in floor and wall tiles. Given the decline in reported kaolin production in 2005 (table 1), it is unclear whether Muhindo started mining operations (Ssonko, 2004, 2005).

Stone, Crushed.—Limestone was quarried by Hima Cement, Kilembe Mines Ltd., and Tororo Cement. The production of limestone rose to 540,756 t in 2005 from a revised 228,776 t in 2004, and the production of pozzolanic materials, to 138,933 t from 134,644 t. Higher limestone production was attributable to rapid growth in the construction sector. In 2005, the value of limestone production amounted to $30 million, and pozzolanic materials, $1.62 million (Grace L. Nassuna, Department of Geological Survey and Mines, Principal Documentation Officer, written commun., July 25, 2006).

Vermiculite.—Canmin Resources Ltd. (a subsidiary of IBI) produced vermiculite at the Namekera Mine. In 2005, a vermiculite processor in the United States signed an agreement with Canmin to purchase between 6,000 and 8,000 t/yr of vermiculite from Canmin starting in the first quarter of 2006. Vermiculite production declined to 2,574 t in 2005 from 2,688 t in 2004 (International Business Investments Corp., 2005).

Mineral Fuels

Petroleum.—Uganda did not have production facilities fpr crude petroleum or petroleum products. In 2005, imports of refined petroleum products amounted to $210.1 million, or 12% of total imports; reexports amounted to $31.5 million, or nearly 4% of total exports (Bank of Uganda, 2005, 2006). Heritage Oil Corp. of Canada and its joint-venture partner Tullow Oil plc of the United Kingdom explored for crude petroleum at Block 3A on Lake Albert. In December 2005, Hardman Resources Ltd. of Australia and Tullow commenced drilling the Mputa-1 well on Block 2, which covered northern Lake Albert and the surrounding onshore area.

Infrastructure

Uganda's electricity production increased to 1,896 gigawatthours (GWh) in 2004 from 1,757 GWh in 2003 and 1,342 GWh in 1999. Most domestic production came from hydroelectric power sources. In 2004, Uganda had a nominal generating capacity of 303 megawatts (MW); peak demand was 265 MW of capacity. Exports of electricity amounted to $3.9 million, or less than 1% of total exports in 2005 (Bank of Uganda, 2005, 2006; undated, p. 183).

By May 2005, prolonged drought across East Africa reduced Uganda's effective generating capacity to 215 MW; peak demand was estimated to be 330 MW of capacity. The resulting shortages of power led to load shedding and higher costs. To alleviate these problems, the Government signed an agreement in April 2005 with Aggreko International Power Projects to build a diesel-fired power station at Lugogo with a capacity of 50 MW (Biryabarema, 2005).

In May, the Government signed an agreement with a consortium led by Industrial Promotion Services (an affiliate of Aga Khan Development Network) to build the Bujagali hydropower project on the Nile River. Bujagali's planned capacity was 250 MW. The project was expected to be completed in about 5 years at a cost of $500 million. An additional 100 MW of capacity could result from the construction of 15 rural electrification projects that included the Buseruka, the Kasese Cobalt, the Kisizi, and the WENRECO mini-hydropower stations, and the Kakira Sugar Works and the Lugazi cogeneration plants (Ampaire, 2005; Daily Nation, 2005).

Outlook

The International Monetary Fund (2006, p. 184) predicted that Uganda's GDP would grow by 6.2% in 2006 and 6.1% in 2007. Most of Uganda's cobalt, columbite-tantalite, gold, and vermiculite production was exported; the outlook for these commodities depended heavily upon world market conditions. For cement, limestone, and pozzolanic materials, the outlook depended primarily upon the strength of the domestic construction sector. The aid provided to Uganda by the African Development Fund, the Nordic Development Fund, and the World Bank Group under the Sustainable Management of Mineral Resources Project could assist the country in increasing production and tax revenues from its mining sector. The unreliability of power supplies could pose serious difficulties for mining and mineral processing operations.

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TABLE 1

UGANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005
UGANDA[2]						
Beryllium, mine output, Be content		NA	NA	--[3]	25	2
Cement, hydraulic		431,084	505,959	507,068	558,988 r	630,000 e
Clay:						
Kaolin		90	178	--	537 r	55
Other		73,505	44,790	44,000 e	44,000 e	51,000 e
Cobalt, refined		634	450 e	--	436	638
Columbium (niobium) and tantalum, ore and concentrate:						
Gross weight	kilograms	11,092	6,463	16,240	376 r	273
Nb content	do.	5,211	3,036	7,600	170 e	130 e
Ta content	do.	2,979	1,736	4,400	100 e	70 e
Gold, mine output, Au content[4]	do.	(5)	3	40	1,447 r	46
Gypsum		--	5	43	181 r	285
Iron ore		1,236	--	--	--	209
Lime, hydrated and quick e		10,000	10,000	10,000	10,000	10,000
Limestone		229,792	140,022	226,408	228,776 r	540,756
Pozzolanic materials		22,782	12,388	65,587	134,644 r	138,933
Salt e		5,000	5,000	5,000	5,000	5,000
Steel e		7,000	7,000	7,000	7,000	7,000
Tin, mine output, Sn content		18	--	1	2 r	--
Tungsten, mine output, W content		17	16	1	52 r	36
Vermiculite		200	664	1,724	2,688	2,574

e Estimated. r Revised. NA Not available. -- Zero.

[1] Table includes data available through August 22, 2006.

[2] In addition to the commodities listed, the following are presumably produced but information is inadequate to estimate output: corundum, lead, marble, sand and gravel, silica sand, and soapstone.

[3] Reported exports.

[4] Does not include smuggled artisanal production.

[5] Less than 1/2 unit.

TABLE 2
UGANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Tororo Cement Industries Ltd.	Tororo	394,000
Do.	Hima Cement Industries Ltd. (Bamburi Cement Ltd., 70%)	Kasese	350,000
Cobalt, refined	Kasese Cobalt Company Ltd. (Blue Earth Refineries Ltd., 75%, and Government, 25%)	do.	1,000
Columbium (niobium) and tantalum	M/S Technical Support and Services Ltd.	Wampewo	11,000[e]
Gold kilograms	M/S Busitema Mining Company Ltd.	Tiira Mine near Busia	400
Lead, refined secondary	Uganda Batteries Ltd.	Kampala	1,000
Steel:[1]			
Crude[2]	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	Jinja	25,000
Do.	Steel Rolling Mills Ltd. (subsidiary of Alam Group Ltd.)	do.	21,000
Billet[2]	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	do.	60,000
Rolled[2]	do.	do.	101,200
Do.	Steel Rolling Mills Ltd. (subsidiary of Alam Group Ltd.)	do.	40,000
Do.	BM Technical Services Ltd.	Mbarara	20,000
Do.	Sembule Steel Mills Ltd.	Kampala	20,000
Stone, crushed	Hima Cement Industries Ltd.	Kasese district	NA
Do.	Kilembe Mines Ltd.	do.	NA
Do.	Tororo Cement Industries Ltd.	Tororo district	NA
Do.	Zzimwe Construction Ltd.	Mukono district	690,000
Soapstone	African Minerals Ltd.	Moroto	NA
Tungsten	Krone Uganda Ltd.	Nyamurilo	115
Vermiculite	Canmin Resources Ltd. (subsidiary of International Business Investments Corp.)	Namekara	25,000

[e] Estimated. NA Not available.

[1] In addition to its crude, billet, and rolled steel facilities, Uganda has a galvanized steel plant with a capacity of 30,000 metric tons per year.

[2] Not operating in 2004; more recent information is not available.

THE MINERAL INDUSTRY OF ZAMBIA

By Philip M. Mobbs

Zambia is a leading producer of cobalt, copper, and gem-quality emerald. Coal, a variety of mineral commodities for the construction industry, other gemstones (primarily amethyst, beryl, and tourmaline), gold, silver, sulfur, and refined petroleum also are produced in Zambia. Zambia has no natural gas or crude oil production and is dependent primarily on hydroelectric power for most of the country's power needs, although there was some coal-fueled electricity power generation.

As a landlocked southern African country, Zambia is dependent on truck and rail transport to sustain most of its international trade; cobalt and copper accounted for more than 60% of merchandise exports. The principal rail routes were northeast to the Port of Dar es Salaam, Tanzania, and south through Zimbabwe to the Port of Beira, Mozambique, or to South African ports. Major highways generally paralleled the rail lines. Crude oil was imported via a pipeline that runs to the Ideni refinery in Ndola from Dar es Salaam.

In 2005, the real gross domestic product (GDP) grew by 5.1% and inflation remained about 18%. The GDP based on purchasing power parity was estimated to be about $10.8 billion, and the GDP per capita based on purchasing power parity was estimated to be about $931. Mining and quarrying accounted for about 8% of the real GDP (Akatu and others, 2006, p. 45; International Monetary Fund, 2006§[1]).

In 2005, extensive exploration for cobalt ores, copper ores, gold ores, nickel ores, uranium ores, and gemstones continued in Zambia. New copper ore production was started by First Quantum Minerals Ltd. of Canada at the Kansanshi open pit and by Konkola Copper Mines at the Fitwaola open pit. Metorex Ltd. of South Africa closed the Chibuluma West Mine after the economic reserves were exhausted and subsequently completed the ramp access to the underground Chibuluma South Mine, which previously had been accessed via a ventilation shaft.

Outlook

Despite some setbacks in the program to privatize the cobalt and copper mining sector, the Government has attracted new private investment to revitalize the formerly declining industry. New copper mine production expected to come online in the near future includes the Lumwana project, of which Equinox Resources Ltd. of Australia acquired the remaining 49% (formerly held by Phelps Dodge Corp. of the United States) in January 2005.

The country faces several internal and external hurdles to mineral resource development; these include cyclical world commodity prices; high transportation costs; limited national infrastructure, particularly west of the Copperbelt; and the threat that high HIV/AIDS rates in the region pose to maintaining a skilled labor force. The nationwide fuel shortages of late 2005, which resulted in the severe cutback in Zambian copper smelter operations, are not expected to adversely affect new mineral processing projects, such as the Sable copper solvent extraction-electrowinning plant.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
ZAMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004[e]	2005[e]
METALS						
Cobalt:						
Mine output, Co content		8,000 [e]	10,000 [e]	11,300	10,000 [r]	9,300
Metal, Co content		4,657	6,144	6,620 [r]	5,791 [r]	5,422 [2]
Copper:[3]						
Mine output, Cu content:						
By concentration or cementation		233,000	258,000	269,000	344,300 [2]	341,000
Leaching, electrowon		79,000	83,000	79,000	82,600 [2]	106,000
Total		312,000	341,000	348,000	426,900 [2]	447,000
Metal:						
Smelter, primary:						
Electrowon, low grade		25,100	NA	NA	NA	NA
Other		215,000	NA	NA	NA	NA
Total		240,100	253,500	268,000	280,100 [2]	270,000
Refinery, primary:						
Electrowon		79,000	83,700	109,000 [r, e]	124,000 [r]	155,000
Other		217,000	253,100	241,000 [r, e]	286,000 [r]	244,000
Total		296,000	336,800	350,000 [r, e]	410,000 [r]	399,000
Gold	kilograms	--	--	--	--	440
Silver	do.	--	--	--	--	2,000
INDUSTRIAL MINERALS						
Cement		215,470	230,379	350,000 [r, e]	390,000 [r]	435,000
Clays:[e]						
Brick		3,000	3,000	3,000	3,300	3,300
Building, not further specified		30,000	30,000	30,000	33,000	33,000
China and ball		200	200	200	200	200
Gemstones:[e]						
Amethyst	kilograms	1,145,029 [2]	1,064,606 [2]	1,000,000	1,100,000	1,100,000
Beryl	do.	1,567 [2]	8,551 [2]	8,000	8,000	10,000
Emerald	do.	764 [2]	1,860 [2]	2,000	2,100	2,500
Garnet	do.	NA [2]	NA [2]	NA	NA	NA
Tourmaline	do.	25,619 [2]	25,755 [2]	25,000	26,000	26,000
Lime, calcined	thousand metric tons	117	151	145 [e]	150	150
Limestone, for cement and lime	do.	61	330	690 [e]	750	750
Limestone, crushed aggregate	do.	450	450	600 [e]	650	650
Sand and gravel, construction[e]	do.	200	200	200	220	220
Sulfur:						
Gross weight:						
Pyrite concentrate		199,400	225,870	226,000	280,000	285,000
Sulfuric acid[4]		63,000	10,000 [e]	10,000	12,000	12,000
Sulfur content:						
Pyrite concentrate (42% S)		83,752 [2]	94,900 [e]	95,000 [e]	118,000	120,000
Sulfuric acid (32.6% S)		20,500	32,600 [r, e]	33,000 [r, e]	39,000 [r]	40,000
Total, S content		102,252	127,500 [r, e]	128,000 [r, e]	157,000 [r]	160,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		104,600 [2]	71,700	71,800	240,000	240,000
Petroleum, refinery products[e]	thousand 42-gallon barrels	--	--	5,000	6,200	5,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through November 29, 2006.

[2] Reported figure.

[3] Terms used are as defined by the International Copper Study Group.

[4] From the Chambishi and the Nkana acid recovery plants.

Sources: Zambia Government data and company reports. Data estimated by the U.S. Geological Survey.

THE MINERAL INDUSTRY OF ZIMBABWE

By Philip M. Mobbs

The Republic of Zimbabwe is a landlocked nation in southern Africa that covers an area of 390,580 square kilometers and supported a population estimated to range from 11 million to more than 13 million. About 5% of the workforce was engaged by the formal mining industry, and minerals accounted for about 4.5% of the gross domestic product (GDP). In 2005, the GDP based on purchasing power parity was estimated to be about \$30.6 billion,[1] and the GDP per capita based on purchasing power parity was \$2,607. In 2005, the rate of real GDP growth, which declined for the seventh year in a row, fell by 6.5% and followed a revised 3.8% decline in 2004 and a 10.4% decline in 2003 (Herald, The, 2006§[2]; International Monetary Fund, 2006§; U.S. Central Intelligence Agency, 2006§; World Bank Group, 2006§).

Domestic and foreign companies that produced minerals or manufactured mineral-based commodities managed to continue operations despite Zimbabwe's hyperinflation, which declined to 238% in 2005 compared with 350% in 2004 and 365% in 2003. The inflation significantly increased domestic costs of such items as electricity, fuel, and wages. With varying success, mineral operations in Zimbabwe coped with the negative effects of routine electrical power outages; the lack of foreign currency to fund equipment imports; and shortages of food, fuel, skilled manpower, spare parts, and tires. Foreign investment, which was primarily funneled through the cement, diamond, gold, and platinum-group metals (PGM) sectors, helped to stave off the collapse of the mineral industry, which produced about 40 minerals or mineral-based commodities chiefly from small- and medium-scale mines. In 2005, several commodities, which included asbestos, coal, cobalt, copper, diamond, ferroalloys, limestone, lithium minerals, magnesite, and PGM, posted production increases (Timberg, 2005; International Monetary Fund, 2006§).

The mineral sector was subject to uncertainty caused by Government policies. The Government's foreign exchange policy often adversely affected mining and mineral-based commodity companies that exported production. The Government's often-violent program to redistribute the ownership of agricultural land that began in 2000 quickly decimated the commercial farming sector, which had been the nation's major source of exports and foreign exchange. By 2003, the value of mineral exports had surpassed that of agricultural goods. In 2004, draft versions of an amendment to the mining law proposed that private mining companies transfer between 25% and 50% of the equity shares of their Zimbabwe operations to historically disadvantaged persons. In 2005, the Government reportedly indicated that while it had no intention to nationalize the mineral industry, it did plan to take some equity interest in privately operated mines. Various organizations informed the Government of the potential negative effects on international investor interest in the mining sector of the proposed seizures of mining company shares and, because of the agricultural land grabs, the perceived reduction of property rights. At yearend, multinational mining companies, especially those in the PGM sector, continued negotiations on the proposed transfer of Zimbabwe mining equity with the Government (Mining Journal, 2004; Reuters, 2004§; News24.com, 2005§).

Commodity Review

Metals

Chromium.—In 2005, Anglo American plc of the United Kingdom sold its 100% interest in Zimbabwe Alloys Ltd. to Benscore Investments (Pvt.) Ltd. of Zimbabwe for \$10 million. The Financial Gazette (2005§) reported that a subsidiary of Anglo American planned to focus its attention on the development of the Unki PGM resources. Also in 2005, a Chinese consortium proposed to build a high-carbon ferrochrome smelter at Selous.

Gold.—Gold accounted for about 50% of the value of total mineral production in Zimbabwe. By law, all gold produced in Zimbabwe had to be sold to Fidelity Printers and Refiners (a subsidiary of the Reserve Bank of Zimbabwe). The Government was concerned with the significant drop in gold deliveries from the small-scale mines and cracked down on gold smuggling and illegal gold panners (an estimated 300,000 to 1 million artisanal gold miners worked in Zimbabwe). Several metric tons of gold were estimated to bypass official export channels annually. After investigations of small- and medium-scale mines by the Ministry of Mines and Mineral Development, several small gold mines were closed for failure to keep proper production records or for alleged sales of gold on the black market. In August, the Zimbabwe Revenue Authority announced a new tax on small-scale gold production; registered gold buyers were required to withhold 5% of gross proceeds from gold sales by small-scale miners. The National Export Strategy, which was disseminated at yearend, sought to more-closely monitor mining sector production and exports (Herald, The, 2005a§, b§).

Metallon Corp. of South Africa had acquired Independence Gold Ltd. from Lonmin plc of the United Kingdom in 2002. Metallon's Zimbabwean subsidiary, Metallon Gold, produced about 35% of official Zimbabwean gold output from the Arcturus, the How, the Mazowe, the Redwing, and the Shamva Mines (Metallon Corp., 2005).

In July, the Government-owned Zimbabwe Mining Development Corp. reopened the Elvington Mine, which it had placed on care and maintenance status in 2003. In July, the partnership of Mmakau Mining (Pty) Ltd. of South Africa (75%) and Shaft Sinkers (Pty) Ltd. of South Africa (25%) acquired Alpha Resources of Zimbabwe from Placer Dome South Africa (Pty) Ltd. Alpha Resources held the rights to the Eureka Mine where the sinking of a 780-meter shaft was initiated in October when the partnership began the conversion of the former open pit operation to an underground mine. Initial underground production was scheduled for mid-2006; mine design called for an 800-metric-ton-per-day (t/d) ore-hoisting capacity [Mmakau Mining (Pty) Ltd., 2005].

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[1] Where necessary, values have been converted from Zimbabwe dollars (Z\$) to U.S. dollars (US\$) at the average rate of Z\$21,621=US\$1.00 for 2005 (the interbank exchange rate started the year about Z\$5,500=US\$1.00 and reached Z\$82,902=US\$1.00 at yearend); the official rate was Z\$824=US\$1.00 and the average auction rate was Z\$5,300 for 2004. In 2003, the official exchange rate was Z\$55=US\$1.00 until March and \$Z824=US\$1.00 for the remainder of the year.

[2] References that include a section mark (§) are found in the Internet References Cited section.

In 2005, Duration Gold Ltd. of China (an affiliate of Mandorin Goldfields Inc. of Canada) acquired the Wanderer Mine, which had operated from 1899 to 1946, and agreed to acquire the Athens, the Durban, the Gaika, the Queens, the Sunace, and the Umviga Mines. Duration also acquired partial interest in the Hope Fountain Project, where it started exploration drilling. Joint venture exploration operations at Tafuna Hill were suspended in 2005 because of site access problems. In November, Duration began milling 200 t/d of tailings from the Athens Mine.

In January, Cluff Gold plc of the United Kingdom acquired Cluff Mining (Zimbabwe) Holdings Ltd., which held 50% interest in the Maligreen Mine (where operations had been suspended in 2002), from the Ridge Mining Group. In April, Mwana Africa Holdings (Pty) Ltd. completed the acquisition of the Freda Rebecca gold mine from AngloGold Ashanti Ltd. of South Africa. In September, African Gold plc of the United Kingdom, which held 100% interest in the Inez Mine, acquired Mwana Africa Holdings; the combined enterprise, which was based in the United Kingdom, was renamed Mwana Africa plc. In December, Mwana Africa plc acquired Cluff Mining from Cluff Gold.

Iron and Steel.—Government negotiations with Shougang International Trade and Engineering Corp. of China on a proposed $200 million investment in exchange for an equity interest in Zimbabwe Iron and Steel Co. (ZISCO) floundered in early 2005. The talks reportedly were scuttled by Shougang's dismay with ZISCO's chronic problems with coal and electricity supply and rail transportation of raw materials and finished product. Published estimates of ZISCO's debts ranged from $30 million to $126 million; major creditors included Hwange Colliery Co. Ltd. of Zimbabwe, National Railways of Zimbabwe, and the Zimbabwe Electricity Supply Authority (Njini, 2005§; Zimdaily.com, 2005§; Muleya, 2006§).

Platinum-Group Metals.—In 2005, Impala Platinum Mines Ltd. (Implats) sold its 30% interest in Makwiro Platinum Mines (Pvt.) Ltd. to Makwiro's majority equity-interest holder, Zimbabwe Platinum Mines Ltd.; in return Implats received additional equity interest in Zimbabwe Platinum Mines Ltd.; for a total of 86.9% interest in the company. In July, Zimbabwe Platinum Mines Ltd. changed its name to Zimplats Holdings Ltd. and changed the name of the operating company [Makwiro Platinum Mines (Pvt.) Ltd.] to Zimbabwe Platinum Mines (Pvt.) Ltd.

At Ngezi, Makwiro and Zimbabwe Platinum Mines (Pvt.) Ltd. mined 1.844 million metric tons (Mt) of ore from the open pit and 474,000 metric tons (t) from the underground mine in 2005. The company milled about 2.03 Mt of ore and smelted 69,330 t of concentrate. More than 5.2 t of PGM (about 2.7 t of platinum, about 2.3 t of palladium, and about 250 kilograms of rhodium) were recovered and sold. Zimplats proposed a $2 billion expansion program, which would increase the total mine output of ore to 10 million metric tons per year (Mt/yr). The expansion plans included eight additional underground mines at Ngezi and three new concentrators (Makombe, 2005§).

In 2005, Mimosa Investments Ltd. of Mauritius, which was a partnership between Aquarius Platinum Ltd. of Australia (50%) and Implats (50%), proposed the Wedza Phase IV project, which would increase the volume of ore milled at the Mimosa underground mine to 1.8 Mt/yr of ore from 1.4 Mt/yr. Mine output was expected to be increased by about 25% to 5.2 t/yr of PGM in concentrate (Aquarius Platinum Ltd., 2005§).

Anglo Platinum Ltd. of South Africa (which was known as Anglo American Platinum Corp. Ltd. prior to May 30, 2005) began underground infrastructure development at its Unki project, which was located near Gweru. Anglo studied the feasibility of expanding the mine's ore output to 1.4 Mt/yr from the original 1-Mt/yr design capacity (Anglo Platinum Ltd., undated§).

Industrial Minerals

Diamond.—Near Zvishavane, Murowa Diamond (Pvt.) Ltd. operated Zimbabwe's only commercial diamond mine. Murowa had developed an open pit and an underground mine in the three-kimberlite deposit that had been discovered in 1997. In 2005, production at Murowa averaged about 21,000 carats per month. SouthernEra Diamonds Inc. of Canada formed a joint venture with Rockover Resources Ltd to explore for kimberlites on the Tsholotsho diamond prospect, which was located northwest of Bulawayo.

River Ranch (Pvt.) Ltd. emerged from bankruptcy and, in 2004, proposed to resume diamond production at its old River Ranch Mine. In 1998, River Ranch had closed the mine because of low diamond prices and Bubye Minerals (Pvt.) Ltd. had been appointed by bankruptcy officials to rehabilitate the equipment and to reprocess the mine dump. River Ranch's planned restart of kimberlite mining operations was sidetracked in January 2005 when the Ministry of Mines and Mineral Development transferred the rights to mine diamonds at River Ranch Mine to Bubye. Legal proceedings ensued. There was no resolution by yearend.

Outlook

The short-term outlook for the mining sector in Zimbabwe is not favorable. Zimbabwe's rampant hyperinflation, which had averaged 238% during 2005, rose rapidly at yearend; inflation reached an annualized rate of 411% in October, 502% in November, and 586% in December. The rate is not expected to decline in 2006. Escalating local costs are expected to continue to impact mineral sector operations adversely in 2006. Side effects of the hyperinflation, which included reduced equipment maintenance and deferred development exploration, will effectively shorten the potential operating lives of mines.

Government intervention in the economy and in state-run industries (such as fuel importation; electricity generation, importation, and distribution; and railway transportation) has resulted in a number of mine closures and suspended projects, which undermines the ability of the mining sector to continue to generate foreign export earnings. Currency regulations make it difficult for Zimbabwean mineral companies to benefit from the global increase in commodity prices (Mugari, 2005§; Mail & Guardian Online, 2006§; Reuters, 2006§).

The significant impact of the Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) epidemic, which was estimated to affect about 25% of the adult population in Zimbabwe, is expected to haunt the remaining workforce for years to come (Coorey and others, 2005, p. 6).

The country has abundant mineral resources and a well-developed (but deteriorated) infrastructure network. Under the expectation that the economic and political climate will eventually improve, the Zimbabwe mineral sector remains attractive in the long term, especially for small- and medium-scale gold mining companies.

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TABLE 1
ZIMBABWE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS						
Chromite, gross weight		780,150	749,339	637,099	668,391	614,720
Cobalt, metal[2]		95	99	79	59	281
Copper:						
Mine output, concentrate, Cu content		2,057	2,502	2,767	2,383	2,570
Metal:						
Smelter output, blister/anode, primary[e]		2,160	--	--	--	--
Refinery output, refined/cathode, primary		8,000	7,200	7,200	7,000 [e]	7,000
Gold	kilograms	18,050	15,469	12,564	21,330	14,024
Iron and steel:						
Mine output, iron ore:						
Gross weight	thousand metric tons	361	272	367	283	377
Fe content[e]	do.	180	136	184	140	185
Metal:						
Pig iron	do.	156	122	182 [r]	145 [r]	125
Steel, crude	do.	149	105	152	150 [r]	119
Ferroalloys:						
Ferrochromium		243,534	258,164	245,299	193,077	218,143
Ferrosilicon chromium	thousand metric tons	17	--	--	1	5
Nickel:						
Mine output, concentrate, Ni content		10,120	8,092	9,516	9,776	8,556
Refinery output, refined metal:						
Refined from domestic materials		7,440	6,765	9,517	9,520 [e]	9,500 [e]
Toll refined from imported materials[3]		12,084	10,812	3,140	2,500 [r, e]	2,500 [e]
Total refined nickel metal		19,524	17,577	12,657	12,200 [e]	12,000 [e]
Platinum-group metals:						
Palladium	kilograms	371	1,943	3,449	3,564	3,879
Platinum	do.	519	2,306	4,270	4,438	4,834
Rhodium	do.	42	218	377	374	404
Ruthenium	do.	NA	178	322	300	317
Iridium	do.	NA	84	152	135	141
Osmium	do.	NA	NA	NA	NA	NA
Total		932	4,729	8,570	8,811	9,575
Silver	kilograms	3,449	1,711	747	3,216	187
Tantalum, mine output, Ta content		21	338	4	14	--
INDUSTRIAL MINERALS						
Asbestos	thousand metric tons	136	168	147	104	122
Barite		7,464	--	--	--	--
Cement, hydraulic[e]	thousand metric tons	800	600	400	400	400
Clays[4]		2,247	3,789	--	500 [e]	500 [e]
Diamond	carats	--	--	--	44,454	251,000
Feldspar		1,055	591	246	1	--
Fluorspar		--	250	--	--	--
Gemstones:						
Amethyst	kilograms	840	NA	NA	NA	NA
Emerald	do.	57	NA	NA	NA	NA
Graphite		11,836	9,912	7,675	10,267	4,298
Kyanite		9,682	5,657	745	210	--
Lithium minerals, gross weight		36,103	33,172	12,131	13,710	37,499
Magnesite		2,439	2,366	1,333	749	893
Nitrogen, N content of ammonia		57,500	60,900	56,300	47,500	45,000 [e]
Perlite[e]		5,000	5,000	5,000	4,000	4,000
Phosphate rock, marketable concentrate		86,611	107,854	95,496	83,391	45,705

See footnotes at end of table.

TABLE 1--Continued
ZIMBABWE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
INDUSTRIAL MINERALS--Continued						
Stone, sand and gravel:						
Granite, black		385,532	408,550	190,372	8,825	--
Limestone	thousand metric tons	3,799	3,169	922	41	84
Silica[5]	do.	28	6,790	2,356	1	1
Sulfur:						
Pyrite:						
Gross weight		98,037	87,592	93,010	81,795	59,683
S content (32.6%)		31,960	28,560	30,320	26,670	19,500
Byproduct acid, metallurgical and coal process gas, S content[e]		2,000	2,000	2,000	1,900	1,500
Total[e]		34,000	30,600	32,300	28,600	21,000
Talc		1,273	911	196	--	--
Vermiculite		11,632	23,803	20,016	27,150	23,045
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous	thousand metric tons	4,064	3,721	2,872	2,476	2,891
Coke, metallurgical[e]	do.	245	224	228	180	200

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through October 24, 2006.

[2]Metal includes metal content of compounds and salts and may include cobalt recovered from nickel-copper matte imported for toll refining.

[3]Toll-refined data includes part of the output from the Bindura Refinery and all the production from the Empress Refinery, which processes imported nickel matte from Botswana.

[4]Includes fire clay.

[5]Includes rough and ground quartz and silica sand.

THE MINERAL INDUSTRIES OF THE MIDDLE EAST

By Philip M. Mobbs, Glenn J. Wallace, David R. Wilburn, and Thomas R. Yager

In 2005, the continued international demand for mineral fuels, especially natural gas and oil, extended the Middle East region's hydrocarbon-based economic boom. The 15 nations of the Middle East that are covered in this volume encompass an area of more than 6 million square kilometers, which is about two-thirds the size of the United States, and about 4% of the world's land mass. In 2005, according to the World Bank Group (2006§[1]), the total population of the Middle East region was estimated to be about 262 million compared with 296 million for the United States and 6.4 billion for the world. Production and processing of crude oil and natural gas were the foundations upon which the economies of most of the countries in the region were based. Production of metals and industrial minerals was a significant factor in the economies of Iran and Turkey; metal production also was an increasingly notable factor in the economies of Bahrain, Oman, Saudi Arabia, and the United Arab Emirates.

Acknowledgments

The U.S. Geological Survey (USGS) acknowledges and expresses its sincere appreciation to the Government agencies and organizations listed below for providing minerals production statistics and basic economic data.

For mineral production statistics—

- Bahrain—National Oil and Gas Authority;
- Cyprus—Mines Service of the Ministry of Agriculture, Natural Resource, and Environment;
- Iran—Iranian Mines and Mining Industries Development and Renovation Organization;
- Israel—Mines Authority of the Ministry of National Infrastructures;
- Jordan—Natural Resources Authority;
- Kuwait—Ministry of Planning;
- Qatar—Ministry of Energy and Industry;
- Saudi Arabia—Ministry of Petroleum and Mineral Resources; and
- Turkey—General Directorate of Mining Affairs, General Directorate of Petroleum Affairs, and State Institute of Statistics.

For basic economic and population data—

- The International Monetary Fund and the World Bank Group in the United States.

General Economic Conditions

As a region, the Middle East was a major supplier of hydrocarbons to the world market. In the region, the economies of the oil-producing nations were buoyed and the economies of oil-import-dependant nations adversely affected by the continued high international market prices for crude oil and natural gas. Merchandise exports of the nations that encircle the Persian Gulf were dominated by hydrocarbons; most of the region's exports of natural gas and oil were shipped to Asia.

In many countries in the region, the abundance of locally produced natural gas and the availability of low-cost electrical energy, coupled with convenient access to ocean transportation, provided the initial justification for the development of such value-added minerals facilities as direct-reduced iron plants, steel plants with electric arc furnaces for the production of crude steel, and steel-rolling mills; energy-intensive mineral-processing operations, such as aluminum smelting; and petrochemical establishments, which included fertilizer plants. Expansion of the nonfuel minerals sector was supported by the national Governments of the area, which strongly endorsed the diversification of their respective economies into nonoil sectors.

The booming demand for consumer products was driven in part by the fast-growing, youthful population of the Middle East. The regional trend toward increased population and the significant increase in regional income associated with the high international oil prices spurred numerous projects in the construction sector; these included commercial office buildings, industrial (especially petrochemical) facilities, retail centers, residential housing, and the infrastructure necessary to support the new buildings and facilities. The demands of the construction boom, however, resulted in significant price increases or outright shortages of construction materials [such as aggregate, aluminum, cement, glass, steel beams, and steel concrete-reinforcing bar (rebar)] and strained the ability of the regional labor force to supply trained personnel.

Investment Data and Political Risk

In 2005, equipment and material cost increases and labor shortages began to impinge on the economic feasibility of the construction of new mineral industry projects or the expansion of existing facilities. Whereas few projects were cancelled or delayed, there was a noticeable trend of contractor cost estimates being significantly above what the Government or private industry client budgeted for or expected.

State-owned companies dominated the Middle East's mineral industry, although foreign investment was finding its way into the minerals sector. In 2005, the sustained international demand for minerals fueled the continued interest in the development or expansion of the mineral operations in the area. New aluminum smelters or smelter-production-capacity expansions, cement plants, hydrocarbon-processing plants, and iron-and-steel-processing facilities were proposed for several countries in the region. Government-funded expansion of copper mining and refining capacity continued in Iran. Progress was made on the privately funded development of copper reserves in Oman, internationally funded development of gold resources in Turkey, Government-funded development of gold resources in Saudi Arabia, foreign-investor-funded development of nickel resources in Turkey, Government-funded development of phosphate resources in Saudi Arabia, and internationally-funded development of zinc resources in Yemen.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The U.S. Government had instituted sanctions on international and U.S. company investment in Iran under Executive Order 12957 of March 15, 1995, Executive Order 12957 of May 6, 1995, Executive Order 13059 of August 19, 1997, Public Law 104-172 (The Iran-Libya Sanctions Act of 1996 [ILSA]) , and Public Law 107-24 (ILSA Extension Act of 2001). During the period covered by the sanctions, several foreign companies had entered into natural gas or oil development projects in Iran. No companies formally had been sanctioned, although they (and the Governments of their home countries) had been made aware of U.S. Government concerns. The ILSA Extension Act, which was subject to renewal, was scheduled to expire in 2006.

Legislation

In Bahrain, in accordance with Royal Decree Number 63 of September 26, 2005, the Ministry of Oil was renamed the National Oil and Gas Authority.

Exploration

Local and international exploration companies were allowed to explore for minerals in most of the countries of the region. Government agencies engaged in mineral prospecting and general exploration included the Geological Survey of Iran, the Department of Geological Survey of the Directorate General of Minerals in Oman, the Saudi Geological Survey, the General Directorate of Mineral Research and Exploration in Turkey, and the Geological Survey and Mineral Resources Board of Yemen. In 2005, metal exploration activity was most notable in Turkey. Exploration and prospecting also was underway in Cyprus, Iran, Oman, Saudi Arabia, the United Arab Emirates, and Yemen. As long as high international mineral prices are sustained, additional exploration activity would be expected.

In the Middle East region, crude oil and natural gas exploration was undertaken by Government and international oil companies. In 2005, hydrocarbon exploration continued in Bahrain, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, the United Arab Emirates, and Yemen. Several field studies were underway to reevaluate oilfield reservoir conditions in Iraq.

Commodity Overview

The Middle East has significant identified resources of boron minerals, bromine, helium, crude oil, natural gas, perlite, phosphate rock, and potash. In tables 5 though 19, estimates for production of major mineral commodities for 2007 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2005) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will occur.

Metals

Alumina and Bauxite and Aluminum.—Bahrain and the United Arab Emirates each accounted for more than 2% of world aluminum production in 2005; as a region, the Middle East accounted for more than 5% of the world's total aluminum production. Much of the produced aluminum was exported, although the increase in regional demand that was attributed to the construction sector had made additional aluminum rolling and fabrication plants more attractive investments in the region, so regional aluminum consumption was expected to increase.

Regional production capacity was expected to increase by about 14% by 2007 compared with that of 2005 and, by 2011, the planned construction of new potlines or expansion of existing facilities in Iran, Oman, Qatar, Saudi Arabia, and the United Arab Emirates was projected to increase regional aluminum capacity by about 140% compared with that of 2005 (table 6). Owing to the Middle East region's limited occurrences of bauxite and the associated limited production of alumina in the region, the proposed expansion of the region's aluminum smelter capacity was expected to greatly increase the region's demand for imports of alumina.

In Bahrain, the commissioning of Aluminium Bahrain B.S.C.'s (Alba) Line 5 increased the Alba smelter's design capacity to 830,000 metric tons per year (t/yr) in 2005. A feasibility study for Alba's proposed 310,000-t/yr-capacity Line 6 was completed, but the expansion project was on hold at yearend.

In Iran, aluminum production capacity was expected to more than double by 2011 with the construction of the proposed smelter for South Aluminium Corp. at Bandar Abbas. Other new aluminum smelters planned for the region included a plant that the Sohar Aluminum Co. proposed to build at Sohar, Oman; the proposed plant of the Qatalum joint venture of Hydro Aluminium AS and Qatar Petroleum at Mesaieed, Qatar; the planned facility of the Az Zabirah project of Saudi Arabian Mining Co. (Ma'aden) at Ras Az Zawr, Saudi Arabia; and the smelter of the Emirates Aluminium joint venture of Dubai Aluminium Co. and Mubadala Development Co. at Khalifa Port, Abu Dhabi, United Arab Emirates. Unlike most of the proposed aluminum projects in the region, which depend on imported alumina, Ma'aden's Az Zabirah project included a bauxite mine at Az Zabirah, Saudi Arabia, and an alumina refinery at Ras Az Zawr. Initial production from the mine was expected in 2010.

When at full production capacity in 2011, the Az Zabirah Mine would triple the region's bauxite output compared with that of 2009 (Middle East Economic Digest, 2006; Aluminium Bahrain B.S.C., 2006§).

Copper.—The Middle East region was a minor contributor to the world's copper stocks. Iran was the most notable copper producer in the region. The Government of Iran's Fourth Five-Year Development Program (2005 to 2009) accounted for much of the region's planned expansion of production capacity of copper ore (the proposed capacity expansions at the Dareh Zereshk and the Songun Mines) and refined copper (the planned expansion of the Sarcheshmeh Refinery).

Other proposed additions to regional copper output included the resumption of copper mining in Oman after a 12-year hiatus, the projected 2006 startup of mining at National Mining Co.'s Ajib pit, and the planned capacity expansion at Çayeli Bakir İşletmeleri A.Ş.' copper mine in Turkey.

Gold.—The Middle East was a significant gold trading region and the region's jewelry manufacturing sector was a noted consumer of gold; the Middle East's gold mines, however, were modest contributors to the world's supply of precious metals. Plans to significantly increase mine output of gold in Iran, Saudi Arabia, and Turkey could result in the region's gold production reaching an annual volume of about 29 metric tons by 2011, which is equivalent to slightly more than one month's gold production in South Africa, which was the world's leading gold producer in 2005.

Iran's gold output was expected to increase as the Agh Darreh Mine, which opened in late 2005, ramped up operations to full production capacity. In Saudi Arabia, Ma'aden expected to increase gold production from the Al-Hajar and the Bulghah Mines and, in 2006, to open the Al-Amar Mine. Ma'aden also planned to start mining operations at the Ad Duwayhi Mine in 2008.

In Turkey, the continued output of the Ovacık Mine, the projected startup of operations at the Kisladag Mine in 2006 and at the Çöpler Mine in 2009, and the potential opening of the Mastra Mine, would increase the country's gold production capacity by 170% by 2011.

Iron and Steel.—In 2005, crude steel production in the Middle East region increased slightly compared with that of 2004; most of the increase was attributed to increased production in Turkey. The short-term demands of the regional construction boom, however, significantly increased Government and institutional investor interest in the construction of new plants to produce crude steel or rolled-steel products, such as rebar. The economic feasibility of expansions of the production capacities of existing crude steel plants also became more attractive.

Much of the planned expansion of iron and steel production capacities in the region was attributed to projects in the Government of Iran's Fourth Five-Year Development Program, which included the proposed construction of new crude steel plants at Ardakan, Azarbayjan, Bafq, and Sirjan, and the scheduled capacity expansions at the steel plants of Iranian Steel Industries National Group, Isfahan Steel Co., Khuzestan Steel Co., and Mobarekeh Steel Co. To help meet the expected increase in raw material demand by the Iranian steel sector, which was dominated by Government-owned companies, expansions of Iranian iron ore mining and concentration capacities were planned at the Chadormalu, the Chah Gaz, the Chuqart, the Gol Gohar, the Jalal Abad-e-Zarand, and the Sangan iron ore operations.

Other proposed new crude steel facilities in the region included the Emirates Iron Industries plant in the United Arab Emirates, the Rajhi Steel Industries plant in Saudi Arabia, and the Shadeed Iron & Steel LLC plant in Oman. Planned increases in crude steel production capacity included the expansions of the Al Azizia Steel Co. Ltd. plant in Saudi Arabia, the facilities of Emirates Steel Establishment in the United Arab Emirates, Hadeed's plant in Saudi Arabia, and the Qatar Steel Co. plant in Qatar.

Lead and Zinc.—Projects of the Government of Iran's Fourth Five-Year Development Program accounted for most of the planned expansion of zinc ore and metal production capacities in the region. Included in the five-year plan were the expansion of production from the Anguran lead-zinc mine and the anticipated construction of a 100,000-t/yr-capacity zinc plant in the Zanjan district. The slight projected increase in the regional lead ore production capacity was associated with the expansion of lead-zinc ore production capacity in Iran (Iranian Mines and Mining Industries Development and Renovation Organization, 2005, p. 195).

Nickel.—In late 2005, European Nickel PLC completed the feasibility study for the Çaldağ Mine in Turkey and, in early 2006, the Turkish Government approved the project's environmental impact assessment. Trial mining of the laterite ore was expected to continue intermittently through 2007. Construction of the mine's heap-leach facilities and processing plant was expected to begin in 2007, with initial production slated for 2008 and full production by 2009. Produced nickel was to be exported.

Industrial Minerals

Phosphate Rock.—The Middle East region accounted for about 9% of the world's phosphate rock production in 2005. In Syria, the expansion of the Alsharqia Mine, which was operated by the General Co. of Phosphate and Mines, was completed. The renovation of the beneficiation plant of the Eshidiya Mine in Jordan was underway. Expected to be completed in 2006, Jordan Phosphate Mines Co.'s initial Eshidiya Mine capacity-expansion project would allow increased production from beds A1 and A3. By 2008, the planned development of the Upper Horizon zone, which was the second phase of the Eshidiya Mine expansion program, would offset the projected decline in production from the company's older mines at Al-Abiad and Al-Hassa.

In Saudi Arabia, the initial production of phosphate rock from the Al Jalamid deposit by Ma'aden was expected to begin in 2008. By 2011, the Al Jalamid Mine was expected to be at full production level, which was slated to be 11.3 million metric tons per year (Mt/yr) of ore with an average grade of 18.9% phosphorous pentoxide (P_2O_5). Ma'aden planned to beneficiate the crude phosphate rock to recover about 4.5 Mt/yr of shipping concentrate, which was expected to have an average grade of 32% P_2O_5 (about 1.4 Mt/yr of P_2O_5 content). Mine operations were expected to continue for at least 27 years. Concentrate was to be shipped to a fertilizer complex to be built at Ras Az Zawr (Saudi Arabian Mining Co., undated§).

Potash.—The Middle East region was the source of about 10% of the world's potash output in 2005. Israel and Jordan recovered potash from the Dead Sea. In Israel, Dead Sea Works Ltd. (a subsidiary of Israel Chemicals Ltd.) had completed a processing plant expansion in 2004 and, in 2005, began a 3-year program to increase its carnallite production capacity of its Dead Sea evaporation ponds. Asia and North America were notable markets for Dead Sea Works potash.

In Jordan, Arab Potash Co. began a 500,000-t/yr capacity-expansion program. By 2008, the company's total potash production capacity will be increased to about 2.45 Mt/yr. Most (about 70%) of the company's potash production was exported to Asia; India and China were the major destinations. Another 15% was shipped to Europe, and about 10% was consumed locally. The fertilizer company, Kemira Arab Potash Co. (a subsidiary of Arab Potash), has been a significant local consumer since it began commercial fertilizer production in 2003 (Arab Potash Co., 2006, p. 26, 28).

Mineral Fuels and Related Materials

Helium.—Qatar joined the short list of helium producers in August 2005 when helium recovery was initiated at Ras Laffan. The Ras Laffan Helium project, which was operated by RasGas Co. Ltd., was a joint venture of Qatar Liquefied Gas Co. Ltd. (Qatargas 1), Ras Laffan Liquefied Natural Gas Co. Ltd. (RasGas I), and Ras Laffan Liquefied Natural Gas Co. Ltd. II (RasGas II). Crude helium was present at a concentration of about 0.04% in the North Field, which is located offshore Qatar. The helium was extracted at the seven natural gas liquefaction lines (trains) of Qatargas 1, RasGas I, and RasGas II that processed natural gas produced from the North Field. The crude helium subsequently was purified and liquefied at Ras Laffan, where seven additional liquefied natural gas (LNG) trains were under construction or scheduled to be built by 2010. The additional natural gas throughput associated with the processing capacity of the new LNG trains in Qatar were expected to significantly increase the volume of recoverable helium in the natural gas processing stream (RasGas Co. Ltd., 2007b§).

Natural Gas.—Unlike the crude oil sector, the Middle East was an intermediate natural gas producing region compared with Europe and North America. The Middle East accounted for about 11% of world natural gas production in 2005 with 5 of the top 30 leading natural gas producing nations located in the region. Iran was the 6th ranked natural gas producer in the world; Saudi Arabia, 9th; the United Arab Emirates, 15th; Qatar, 17th, and Oman, 29th (BP plc, 2006, p. 24).

Energy-intensive industries, such as aluminum smelters, direct-reduction iron facilities, and crude steel plants that use electric arc furnaces, were attracted to the Middle East by the abundance of natural gas and the development of industrial areas with easy access to marine transport. In 2005, of the estimated 290 billion cubic meters of gas produced in the region, 251 billion cubic meters were consumed or processed locally. A substantial volume of produced natural gas was liquefied and exported by ship. The region supported a substantial petrochemical industry that used natural gas as a feedstock. The petrochemical sector included ammonia and methanol plants. Natural-gas-fueled stand-alone electricity-generating plants and generating plants that were associated with water desalinization plants also pushed up the regional consumption of gas. Additional produced natural gas was compressed and exported via pipeline (BP plc, 2006, p. 24, 27).

Natural gas production capacity in the Middle East was expected to be about 35% higher by 2011 compared with that of 2005. The continued development of the North Field, which is located offshore Qatar, and the South Pars gasfield, which is located offshore Iran and which is a geological extension of the North Field, would account for much of the expected capacity expansion.

Construction of additional LNG trains in the Middle East region was planned. In Qatar, the seven LNG trains that were operational in 2005 had a total production capacity of 25.5 Mt/yr. Seven more LNG trains, which had a total production capacity of 51.5 Mt/yr, were under construction at Ras Laffan or were approved to be built by 2010. By 2007, Qatar also was scheduled to provide natural gas to the Dolphin Energy Ltd. pipeline, which was to link Qatar with the United Arab Emirates and Oman, and to the Oryx gas-to-liquids plant, which was under construction. The Government imposed a moratorium on new natural gas export projects in 2005. The moratorium was not scheduled to expire until 2012 (Qatar Liquefied Gas Co. Ltd., 2007§; RasGas Co. Ltd., 2007a§).

Other planned LNG plants in the region included the following three new South Pars projects in Iran: the two-train 10-Mt/yr-capacity Pars LNG project, which was scheduled to be online by 2009; the two-train 10-Mt/yr-capacity Iran LNG project (also known as the NIOC LNG project), which was scheduled to start up in 2010; and the two-train 16-Mt/yr-capacity Persian LNG project, which was planned to begin production in 2011. In recent years, however, the completion of many of the development phases of the South Pars natural gas development program have been delayed significantly (Daya, 2005; National Iranian Gas Export Co., undated§).

Typically, because of the expenditure of hundreds of million of dollars associated with the construction of an LNG facility, the LNG project owners must secure adequate long-term LNG-sales contracts to prove to funding institutions that there is a long-term demand for the plant's production. Importation of Iranian LNG, much of which initially would require a long-term sales contract, however, has been interpreted as not being an investment in the Iranian energy sector and, therefore, has not been subject to U.S. sanctions (Katzman, 2006).

In Oman, Oman Liquefied Natural Gas LLC planned to increase its two-train production capacity to 7.2 Mt/yr, which was a 600,000-t/yr expansion. In Yemen, Train 1 of the 6.7-Mt/yr-capacity Yemen LNG Co. Ltd. production facility at Balhat was expected to start operations in 2008, and Train 2 was scheduled to initiate production in 2009 (Gavin, 2005; Middle East Economic Digest, 2005).

Petroleum.—In 2005, 5 of the top 14 leading oil-producing nations were located in the Middle East. Saudi Arabia was ranked 1st in oil production in the world; Iran, 4th; the United

Arab Emirates, 10th; Kuwait, 11th; and Iraq, 14th. In 2005, regional crude oil production increased by about 2% compared with that of 2004. Most of the region's crude oil was exported, although about 23% of production was refined locally. Iran, Iraq, Kuwait, Saudi Arabia, and the United Arab Emirates were among the world's leading oil exporters. In 2005, countries of Asia were the primary destination of regional oil exports and received about 67% of exported oil. Europe received 16% of Middle East oil exports; North America, 13%; and Africa, 4% (BP plc, 2006, p. 8, 11, 20; Kuwait Petroleum Corp., 2006, p. 29; Saudi Arabian Oil Co., 2006, p. 31; U.S. Energy Information Administration, 2006a, b).

In 2005, the countries of the Middle East accounted for about 22% of the crude oil and 18% of total petroleum (crude oil and refined products) imported by the United States compared with 26% and 21%, respectively, in 2003. The average free-on-board (f.o.b.) cost of crude oil imports entering the United States from Persian Gulf nations was $47.21 per barrel in 2005 compared with $33.08 per barrel in 2004, and $25.17 per barrel in 2003 (U.S. Energy Information Administration, 2007a§-c§).

Saudi Arabian Oil Co. continued a program to expand its crude oil production capacity to 12.5 million barrels per day (Mbbl/d) by 2009. The increased production capacity would allow Saudi Arabia to maintain from 1.5 to 2 Mbbl/d of production capacity in excess of expected demand that could be used to offset unexpected disruptions to the international petroleum supply. Most of the other planned increase in production capacity in the region was attributed to new oilfield development in Iran, which planned to increase production capacity to 5 Mbbl/d by 2010. In other oil-producing countries in the region, planned oilfield production capacity expansion programs called for increases in the 100,000- to 500,000-barrel-per-day range (Turkish Petroleum Corp., 2006, p. 7; U.S. Energy Information Administration, 2005§; 2006a§, b§).

Uranium.—In Iran, production of uranium began at the Saghand Mine in 2005 and at the Gchine Mine in 2004, but available information is inadequate to estimate output. In the past, Iraq had recovered uranium during processing of phosphate rock from the Akashat Mine at the Al Qaim phosphoric acid plant, but available information is inadequate to estimate output.

The phosphate rocks of the Al Jalamid phosphate deposit in Saudi Arabia, which was under development, were similar to those of the Akashat Mine, which is located about 200 kilometers north of Al Jalamid. The secondary uranium mineralization associated with the phosphate at the Akashat Mine, however, was not observed during the evaluation of the Al Jalamid phosphate deposit in Saudi Arabia (Wynn, 1996§).

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TABLE 1
MIDDLE EAST: AREA AND POPULATION (2005)

Country	Area[1] (square kilometers)	Estimated population[2] (millions)
Bahrain	665	0.7
Cyprus	9,250	0.8
Iran	1,648,000	67.7
Iraq[1]	437,072	26.1
Israel	26,990	10.5
Jordan	92,300	5.4
Kuwait	17,820	2.5
Lebanon	10,400	3.6
Oman	212,460	2.6
Qatar	11,437	0.8
Saudi Arabia	1,960,582	24.6
Syria	185,180	19.0
Turkey	780,580	72.6
United Arab Emirates	82,880	4.5
Yemen	527,970	21.0
Total	6,003,586	262.3
United States	9,631,418	296.5
World	148,940,000 [3]	6,437.8

[1] Source: U.S. Central Intelligence Agency, World Factbook 2005.

[2] Source: World Bank Group, World Development Indicators Database, April 2006.

[3] Land area.

TABLE 2
MIDDLE EAST: ECONOMY IN 2005[1,2]

Country	Gross domestic product based on purchasing power parity: Total (billion dollars)	Gross domestic product based on purchasing power parity: Per capita (dollars)	Real gross domestic product growth rate (percentage)
Bahrain	$16	$21,565	6.9
Cyprus	17	21,177	3.7
Iran	555	7,980	5.4
Iraq[3]	94	1,900	3.1
Israel	158	23,474	5.2
Jordan	28	5,096	7.2
Kuwait	47	16,301	8.5
Lebanon	24	6,681	1.0
Oman	41	16,862	6.7
Qatar	25	31,397	6.5
Saudi Arabia	352	15,229	6.6
Syria	72	3,847	2.9
Turkey	569	7,950	7.4
United Arab Emirates	131	27,957	8.5
Yemen	19	751	3.8
Total	$2,148	XX	XX
United States	12,278	41,399	3.2
World	61,028	XX	4.9

XX Not applicable

[1] Source: International Monetary Fund, World Economic Outlook Database, September 2006.

[2] Table data compiled February 9, 2007; may be different from that presented in individual country chapters.

[3] Source: U.S. Central Intelligence Agency, World Factbook 2005.

TABLE 3
SELECTED EXPLORATION SITES IN 2005

Country	Type[1]	Prospect	Commodity	Companies	Resource notes[2]	Exploration notes
Turkey	D	Çaldağ	Nickel, cobalt	European Nickel PLC	380,000 metric tons of nickel, 22,000 metric tons of cobalt	Feasibility study completed; initial construction to start in late 2006.
Do.	F	Çöpler	Gold	Anatolia Minerals Development Ltd.	118,000 kilograms of gold	Drilled 29,564 meters in 2005.

[1] D--Development approved or onging. F--Feasibility work completed or ongoing.

[2] Resources reported where available based on data from various public sources. Data were not verified by the U.S. Geological Survey.

TABLE 4
MIDDLE EAST: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2005[1]

(Thousand metric tons unless otherwise specified)

	Metals			Industrial minerals					Mineral fuels and related products	
									Petroleum	
Country	Aluminum, metal, primary	Chromite, mine output, gross weight	Steel, crude	Ammonia, N content	Cement, hydraulic	Gypsum	Phosphate rock, gross weight	Potash, K_2O equivalent	Crude, including condensate (thousand 42-gallon barrels)	Refinery products (thousand 42-gallon barrels)
Bahrain	751	--	--	330	191	--	--	--	13,348	97,716
Cyprus	--	--	--	--	1,805 ^{p}	210 ^{p}	--	--	--	--
Iran	220	224	7,405	1,020	32,650	13,000	250	--	1,350,000 ^{e}	545,000 ^{e}
Iraq	--	--	--	30 ^{e}	3,015	--	3 ^{e}	--	660,000	100,000 ^{e}
Israel	--	--	350 ^{e}	--	5,093	107	3,000	2,260	23	81,358
Jordan	--	--	140 ^{e}	--	4,046	140	6,375	1,115	8	31,800 ^{e}
Kuwait	--	--	--	467	2,700 ^{e}	--	--	--	939,276	313,000 ^{e}
Lebanon^{e}	--	--	--	--	4,500	2	--	--	--	--
Oman^{e}	--	19	90	--	2,500	60	--	--	282,616 ^{2}	31,573 ^{2}
Qatar	--	--	1,057	1,750	1,400 ^{e}	--	--	--	290,000 ^{e}	43,500 ^{e}
Saudi Arabia	--	--	4,185	1,780	26,064	713	--	--	3,398,000 ^{2}	720,640
Syria^{e}	--	--	70	120	4,700	440	3,850 ^{2}	--	171,185 ^{2}	88,300
Turkey	60 ^{e}	700 ^{e}	20,960	330	42,787	250	--	--	16,500 ^{e}	179,000 ^{e}
United Arab Emirates^{e}	722	NA	70	360	8,000	100	--	--	830,000	200,000
Yemen^{e}	--	--	--	--	1,550	38	--	--	149,000	40,000
Total	1,750	943	34,300	6,190	141,000	15,100	13,500	3,380	8,100,000	2,470,000
Share of world total	5%	5%	3%	5%	6%	13%	9%	10%	30%	9%
United States	2,480	--	93,300	8,040 ^{3}	101,000	17,200	35,800	1,300	1,890,000	5,690,000
World total	31,900	18,800	1,130,000	123,000	2,310,000	116,000	149,000	33,300	27,300,000	26,600,000

^{e}Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. ^{p}Preliminary. -- Zero or zero percent.

[1] Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of March 2007.

[2] Reported figure.

[3] Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

TABLE 5

MIDDLE EAST: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	100,000	148,000	485,130	365,000	400,000	500,000	710,000
Saudi Arabia	--	--	--	--	--	--	2,800,000
Turkey	773,000	232,278	458,537	475,349	460,000	460,000	460,000
Total	870,000	380,000	944,000	840,000	900,000	1,000,000	4,000,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 6

MIDDLE EAST: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM PRODUCTION, 1990-2011[1]

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Bahrain[1]	213,000	450,709	509,308	750,710	873,000	875,000	880,000
Iran	60,000	119,400	140,000	220,000	220,000	220,000	500,000
Oman	--	--	--	--	--	350,000	350,000
Qatar	--	--	--	--	--	50,000	585,000
Saudi Arabia	--	--	--	--	--	--	300,000
Turkey	61,000	61,514	61,000	60,000	60,000	60,000	60,000
United Arab Emirates	174,000	247,400	470,000	722,000	861,000	920,000	1,560,000
Total	510,000	879,000	1,180,000	1,750,000	2,000,000	2,500,000	4,200,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] May include some secondary aluminum produced from used beverage cans.

TABLE 7

MIDDLE EAST: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2011[1]

(Metal content of concentrate in thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	66	102	125	208	210	280	350
Oman	14	--	--	--	10	20	20
Saudi Arabia	1	1	1	1	1	1	1
Turkey	33	24	70	48	56	58	60
Total	114	127	196	257	280	360	430

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Copper content of mined ore (gross weight).

TABLE 8

MIDDLE EAST: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 1990-2011[1]

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Cyprus[2]	--	--	5,197	--	--	--	--
Iran	47,800	90,400	155,856	152,000	155,000	250,000	400,000
Oman	12,000	33,900	24,281	24,000	25,000	25,000	25,000
Turkey	84,200	100,300	64,100	95,000	95,000	95,000	95,000
Total	144,000	225,000	249,000	270,000	280,000	370,000	520,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] May include secondary.

[2] Electrowon.

TABLE 9
MIDDLE EAST: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2011

(Metal content of ore in kilograms)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	500	630	216	200	1,800	2,000	3,500
Oman	54	591	551	--	--	--	--
Saudi Arabia	3,540	8,080	3,800	7,456	8,000	11,000	12,000
Turkey	1,010	1,200	500	5,000	7,000	9,000	13,500
Total	5,100	10,500	5,100	12,700	17,000	22,000	29,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 10
MIDDLE EAST: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 1990-2011

(Metal content of ore in thousand metric tons)

Country	Average grade	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	49%	1,800	4,500	5,800	9,000	10,000	15,000	30,000
Turkey	53%	2,690	2,750	2,200	2,450	2,500	2,600	3,000
Total		4,500	7,300	8,000	11,000	13,000	18,000	33,000

[e] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 11
MIDDLE EAST: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 1990-2011

(Thousand metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	1,425	4,696	6,600	7,405	14,500	20,000	29,000
Iraq	150	300	50	--	--	--	--
Israel	144	200	270	350	380	380	380
Jordan	179	30	30	140	340	410	410
Oman	--	--	--	90	90	600	1,200
Qatar	580	614	744	1,057	1,200	1,500	1,500
Saudi Arabia	1,833	2,451	2,973	4,185	5,200	5,200	6,500
Syria	76	70	70	70	70	70	70
Turkey	9,322	12,744	14,325	20,960	21,000	22,000	25,000
United Arab Emirates	--	--	70	70	100	1,700	1,700
Total	13,700	21,100	25,100	34,300	43,000	52,000	66,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 12
MIDDLE EAST: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2011

(Metal content of concentrate in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	11,000	15,900	18,000	22,000	23,000	23,000	26,000
Saudi Arabia	250	50	50	30	50	50	50
Turkey	11,000	1,196	8,500	21,000	20,000	20,000	20,000
Total	22,000	17,100	27,000	43,000	43,000	43,000	46,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 13
MIDDLE EAST: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	--	4,000	15,000	20,000	20,000	20,000	20,000
Turkey	5,400	2,000	--	--	--	--	--
Total	5,400	6,000	15,000	20,000	20,000	20,000	20,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 14
MIDDLE EAST: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2011

(Metric tons)

Country[1]	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	10,000	41,200	35,000	48,000	40,000	30,000	30,000
Israel	--	8,200	13,000	27,000	27,000	27,000	27,000
Turkey	3,600	2,000	4,000	6,000	5,000	5,000	5,000
Total	14,000	51,000	52,000	81,000	72,000	62,000	62,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

-- Negligible or no production.

[1] In addition to the countries listed, Saudi Arabia also produces secondary lead, but information is inadequate to estimate production.

TABLE 15
MIDDLE EAST: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1990-2011

(Metal content of ore in metric tons)

Country	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Turkey	--	--	--	1,000	1,500	20,000	20,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 16
MIDDLE EAST: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2011

(Metal content of ore in metric tons)

Country[1]	1990	1995	2000	2005	2007[e]	2009[e]	2011[e]
Iran	29,000	145,100	90,000	125,000	130,000	130,000	150,000
Saudi Arabia	2,470	500	3,000	1,500	2,000	3,000	3,000
Turkey	39,000	9,118	39,000	50,000	55,000	60,000	60,000
Total	71,000	155,000	132,000	177,000	190,000	190,000	210,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[1] In Yemen, zinc ore with an estimated metal content of 40,000 metric tons (t) was expected to be produced in 2009. The volume was expected to increase to 75,000 t of zinc content in 2011. The ore will be treated hydrometallurgically and not concentrated.

TABLE 17
MIDDLE EAST: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2011

(Metric tons)

Country	1990	1995	2000	2005	2007^{e}	2009^{e}	2011^{e}
Iran	--	--	51,475	120,000	120,000	150,000	230,000
Turkey	21,100	17,050	--	--	--	--	--
Total	21,100	17,100	51,500	120,000	120,000	150,000	230,000

^{e}Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

TABLE 18
MIDDLE EAST: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2011

(P_2O_5 content of ore in thousand metric tons)

Country	1999	1995	2000	2005	2007^{e}	2009^{e}	2011^{e}
Iran	NA	NA	20	30	20	30	40
Iraq	270	300	200	1	--	--	--
Israel	1,104	1,264	1,305	800	800	800	800
Jordan	2,010	1,655	1,824	2,100	2,700	2,500	2,500
Saudi Arabia	--	--	--	--	--	1,000	1,400
Syria	511	477	646	1,190	1,190	1,190	1,190
Total	3,900	3,700	4,000	4,100	4,700	5,500	5,900

^{e}Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. NA Not available. -- Negligible or no production.

TABLE 19
MIDDLE EAST: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2005	2007^{e}	2009^{e}	2011^{e}
Iran	1,440	1,640	2,002	2,500	3,000	3,200	4,500
Turkey	52,530	59,408	64,645	58,676	55,000	50,000	50,000
Total	54,000	61,000	66,500	61,200	58,000	53,000	55,000

^{e}Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[1] Includes anthracite, bituminous, and lignite.

THE MINERAL INDUSTRY OF BAHRAIN

By Philip M. Mobbs

The island Kingdom of Bahrain had a total land area of about 665 square kilometers and supported a population of about 725,000 on five main islands located in the Gulf of Bahrain between Qatar and Saudi Arabia. In 2005, the gross domestic product (GDP) based on purchasing power parity was estimated to be about $15.8 billion[1] and the GDP per capita based on purchasing power parity was estimated to be about $19,800. Revenue associated with the production of crude oil accounted for a significant segment of the economy. The aluminum sector also figured prominently in the country's mineral economy (Bahrain Monetary Agency, 2006, p. 30; International Monetary Fund, 2006§[2]).

Of the country's total merchandise export earnings in 2005 of about 10 billion, Bahraini exports of crude oil and refined petroleum products were valued at about $7.8 billion compared with about $5.5 billion in 2004. In 2005, total national merchandise imports were valued at about $7.6 billion (Bahrain Monetary Agency, 2006, p. 31).

Commodity Review

Metals

Aluminum.—In 2005, Aluminium Bahrain B.S.C.'s (Alba) inaugurated its fifth aluminum potline, which had a design capacity of 307,000 metric tons per year (t/yr). With the startup of potline 5, Alba's facilities at Sitra had a total capacity of 837,000 t/yr (Mining Journal, 2005).

Mineral Fuels and Related Materials

Petroleum, Refined Petroleum Products, and Sulfur.—In 2005, Bahrain Petroleum Co. B.S.C. (Closed) (Bapco) completed 27 shallow oilwells in the Bahrain Field and, in the deeper Khuff reservoir, 5 natural gas wells. The PTT Exploration and Production Co. of Thailand agreed to undertake a 1-year geologic and geophysical study of offshore oil Blocks 1 and 2 for Bapco. Bapco completed a $3.4 million liquefied petroleum gas (LPG) project, which redirected natural gas that previously had been flared or used as refinery fuel to Bahrain Natural Gas Co. B.S.C., which recovered butane, naphtha, and propane valued at more than $11 million from the gas stream. Construction continued on the $658 million low-sulfur diesel production project, which would reduce the sulfur content of Bapco's diesel production to two streams of 10 parts per million (ppm) and 50 ppm, respectively, compared with recent diesel output, which contained about 7,000 ppm sulfur in 2004. Bapco continued with the development of its $140 million refinery gas desulfurization (RGD) project, which would reduce hydrogen sulfide in the refinery's wastewater discharge and sulfur dioxide emissions from the refinery's stacks. The RGD project included plans to install a $37 million 225-metric-ton-per-day-capacity sulfur recovery unit. Bapco and Neste Oil Corp. of Finland continued negotiations on the construction of a $175 million 400,000-t/yr-capacity sulfur-free lubricant base oil facility [Bahrain Petroleum Co. B.S.C. (Closed), 2006, p. 9-10; Bahrain Tribune, 2004§].

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[1] Where necessary, values have been converted from Bahraini dinars (BhD) to U.S. dollars (US$) at the rate of BhD0.377=US$1.00.

[2] References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1
BAHRAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
Aluminum, smelter output, primary metal		522,749	518,924	531,991	531,626	750,710
Cement		88,700	66,986	129,256	153,483	191,400
Gas, natural:						
Gross	million cubic meters	12,018	12,154	12,305	12,130	13,320
Dry	do.	9,285	9,429	9,622	9,194	10,278
Methanol		412,122	405,763	370,008	398,406	375,609
Natural gas plant liquids:						
Propane	thousand 42-gallon barrels	1,058	1,099	1,021	1,032	1,065
Butane	do.	968	961	922	981	1,015
Naphtha	do.	1,598	1,610	1,647	1,786	1,783
Nitrogen, N content of ammonia		372,000	377,400	311,900	311,300	329,745
Petroleum:						
Crude[3]	thousand 42-gallon barrels	13,656	13,800	13,720	13,647	13,348
Refinery products:						
Liquefied petroleum gas	do.	353	350[e]	350[e]	425[r]	452
Gasoline	do.	6,182	6,500[e]	7,000[e]	6,439[r]	7,309
Jet fuel	do.	15,497	16,000[e]	16,000[e]	17,268[r]	19,956
Kerosene	do.	2,777	3,000[e]	5,000[e]	2,436[r]	1,101
Distillate fuel oil	do.	17,188	18,000[e]	20,000	18,210[r]	19,278
Residual fuel oil[e]	do.	25,000	26,000	29,000	28,900	29,000
Other[e]	do.	20,800	21,300	15,000	19,000	20,600
Total	do.	87,765	91,122	92,350	92,669	97,716
Sulfur		67,480	67,381	60,455[r]	71,258	71,963

[e] Estimated; estimated data are rounded to no more than three significant digits and may not add to totals shown. [r] Revised.

[1] Table includes data available through July 12, 2006.

[2] In addition, iron ore was pelleted and exported for use by direct-reduction plants. Pellets were produced from imported iron ore. Granular urea has been produced from locally produced ammonia since 1998.

[3] Does not include production from the Abu Saafa Field.

THE MINERAL INDUSTRY OF CYPRUS

By Philip M. Mobbs

The mineral industry of Cyprus[1] was dominated by the production of bentonite, cement, sand and gravel, and stone. Other mineral commodities produced included common clay, gypsum, ocher, perlite, and umber. In northern Cyprus, the mineral industry was dominated by the production of construction aggregates, stone, and umber.

In 2005, Cyprus' gross domestic product (GDP) based on purchasing power parity was estimated to be about $17.5 billion and the GDP per capita based on purchasing power parity was more than $21,200. The real GDP increased at an annual rate of 3.7% (International Monetary Fund, 2006§[2]).

Cyprus, which was located in the eastern Mediterranean Sea, had an area of 9,250 square kilometers (km^2), of which 3,355 km^2 was administered by Turkish Cypriots (U.S. Central Intelligence Agency, 2006§).

Commodity Review

Metals

Copper.—In May, Hellenic Copper Mines Ltd. closed its copper mine and solvent extraction-electrowinning operations at Skouriotissa after unsuccessful attempts to sell the venture. The closure was attributed to accumulated debt, fiscal loses, and high overhead. Production had been suspended in late 2004 (Kambas, 2005§).

Eastern Mediterranean Minerals Ltd. of Cyprus, which was a joint venture of Eastern Mediterranean Resources Public Ltd. of Cyprus (95%) and Hellenic Mining Co. of Cyprus (5%), continued its exploration for copper in the Troodos Complex and drilled prospects at Klirou, North Alestos, and South Pano Koutrafas.

Outlook

In 2006, construction is expected to maintain the domestic demand for cement, gypsum, sand and gravel, and stone. International demand from the cat litter, construction, oilfield drilling fluids, and pigments industries is expected to maintain Cypriot exports of bentonite, gypsum, perlite, and umber.

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[1] Unless specifically stated, all data in this chapter are for the Republic of Cyprus in southern Cyprus because data related to areas of northern Cyprus administered by Turkish Cypriots are sparse or unavailable. The two areas have been separated since 1974.

[2] References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1
CYPRUS: PRODUCTION OF MINERAL COMMODITIES[1, 2, 3]

(Thousand metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
Cement, hydraulic		1,369	1,438	1,637	1,689	1,805
Clays:						
Bentonite	metric tons	126,600	128,400	144,859	155,717	172,366
Other:						
For brick and tile manufacture		300	350	350 [e]	425	443
For cement manufacture		440	480	550	565	600
Total		740	830	900 [e]	990	1,043
Copper, refined[4]	metric tons	5,176	3,695	2,552	1,240	--
Gypsum, crude[5]	do.	250,000	295,000	300,000	255,000	210,000
Lime, hydrated	do.	9,400	12,190	13,370	13,990	16,589
Petroleum refinery products:[6]						
Liquefied petroleum gases	thousand 42-gallon barrels	359	378	330	80	--
Gasoline	do.	1,277	1,313	1,242	300	--
Kerosene and jet fuel	do.	288	281	301	70	--
Distillate fuel oil	do.	2,911	2,704	2,437	600	--
Residual fuel oil	do.	3,156	2,914	2,411	600	--
Asphalt and bitumen	do.	239	217	194	50	--
Other	do.	19	17	--	--	--
Total	do.	8,248	7,824	6,916	1,700	--
Sand and stone:						
Limestone, crushed (Havara)		1,500	2,000	1,000	1,200	1,000
Marble		2	2	2	1	2
Marl, for cement production		1,780	1,950	2,220	2,290	2,450
Sand and gravel[7]		9,300	10,500	10,700	11,600	12,064
Building stone[8]		55	80	103	105	51
Sulfur[e]	metric tons	1,400	1,300	1,300	300	--
Umber	do.	4,800	5,500	5,500	5,205	5,088

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. --Zero.

[1] Table includes data available through August 29, 2006.

[2] Small quantities of the mineral pigments ocher and terra verte are mined intermittently. Mineral production data from areas of northern Cyprus that are administered by Turkish Cypriots and production of fertilizers, perlite, and secondary metals from scrap are not included in this table because available information is inadequate to make estimates of output.

[3] Sources of data include company annual reports, the Mines Service of Cyprus, and the Statistical Service of Cyprus.

[4] Skouriotissa copper plant was closed in November 2004.

[5] About 4,000 metric tons per year of gypsum was calcined.

[6] Refinery closed in April 2004. Petroleum refinery products are rounded to the nearest thousand barrels; may not add to totals shown.

[7] Includes crushed aggregate.

[8] Includes crude, semifinished, and worked stone.

THE MINERAL INDUSTRY OF IRAN

By Philip M. Mobbs

Iran had an extensive mineral production and processing sector. Most of the country's active mines were privately owned, although the Government retained control of many of the larger mineral commodity companies, especially those that produced aluminum, ammonia, cement, coal, copper, iron and steel, natural gas and oil, salt, and sulfur. Iran's hydrocarbon sector, which included the production of natural gas and oil, the refining of crude oil, and the distribution of hydrocarbons, was a significant facet of the country's economy. Production, processing, transportation, and sales of crude oil and natural gas accounted for about 11% of the country's gross domestic product (GDP) and about 60% of Government revenues. According to the U.S. Energy Information Administration (2006), Iranian crude oil production averaged about 4.1 million barrels per day in 2005; Iran was the world's fourth ranked producer of crude oil after Saudi Arabia, Russia, and the United States.

The Ministry of Industries and Mines administered all mining, smelting, and refining industries except the oil and gas sectors, which were administered by the Ministry of Petroleum. Basic geologic exploration and most initial evaluations of the nation's mineral resources (except hydrocarbons) were performed by the Geological Survey of Iran. Other mineral commodities, which included coal, industrial minerals, and metals, accounted for about 2% of the GDP.

The International Monetary Fund (2006§[1]) estimated that Iran's GDP in 2005 was about $555 billion (based on purchasing power parity), the GDP per capita based on purchasing power parity was about $7,980, and the real GDP increased by about 5.4%.

Trade

The Central Bank of the Islamic Republic of Iran (2006, p. 13) reported that hydrocarbon exports were valued at $48.8 billion[2] in Iranian year 1384 (the period from March 21, 2005, to March 20, 2006) compared with a revised value of $36.3 billion in Iranian year 1383 and about $27.4 billion in Iranian year 1382. Crude oil exports accounted for more than 85% of hydrocarbon exports; natural gas and refined petroleum products accounted for the remainder. In Iranian year 1384, hydrocarbons accounted for 81% of total exports, which were valued at $60 billion. Exports to the United States were limited by the U.S. Government embargo on goods and services of Iranian origin. For the 2005 calendar year, Iranian exports to the United States were valued at $168 million, of which mineral-commodity trade accounted for less than $40,000 (U.S. International Trade Commission, 2006b§; U.S. Office of Foreign Assets Control, undated).

Total Iranian imports in Iranian year 1384 were valued at about $41 billion. Mineral-commodity imports from the United States were negligible (Central Bank of the Islamic Republic of Iran, 2006, p. 13; U.S. International Trade Commission, 2006a§).

Outlook

Numerous development or expansion projects are planned or underway in the metals sector, especially in the aluminum, copper, ferroalloys, gold, iron and steel, and zinc industries. In the industrial minerals sector, development or expansion projects in the cement, magnesium compounds, potash, and stone industries are expected to be completed within the next 5 years. The acquisition of funding for capital-intensive development of mineral-related projects by Government-controlled and private companies operating in Iran, however, was impaired by the Government's continued development of a nuclear reactor at Bushehr, which adversely affected the country's international relations. The stated objective of the Bushehr plant to provide low-cost nuclear-powered electrical energy to the domestic market, which would allow natural gas and oil to be exported for income instead of burned for fuel in Iran, was overshadowed by international concern about the potential for the development of nuclear weapons in Iran. The electricity-generating plant at Bushehr was expected to become operational in 2007.

More than 60% of Iranian oil production was exported in 2005. Domestic and international demand for crude oil is expected to increase in the future, which will require Iran to increase production to meet demand. State-owned oil companies are expected to continue to increase offshore and onshore petroleum exploration efforts; in the future, these efforts may be supplemented by funding and work by international firms and foreign-government-owned oil companies. The development of identified natural gas and oil resources is expected to continue, subject to limitations imposed by the economic sanctions of the United States, which prohibit companies and persons from the United States from performing services or supplying goods or technology that could benefit the Iranian oil industry. The development of the multiphase South Pars natural gas project is expected to continue for a number of years. New construction and renovation of existing oil refineries is expected to begin during the next 5-year plan (2005 to 2009).

Additional information on the mineral industry of Iran can be found in the 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area reports—International—Africa and the Middle East.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Where necessary, values have been converted from Iranian rials (Rl) to U.S. dollars (US$) at the average exchange rate of Rl9,026=US$1.00.

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Major Publication

Iranian Mines and Mining Industries Development and Renovation Organization: Mines & Mining in Iran, 2005.

TABLE 1
IRAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005[e]
METALS						
Aluminum:						
Bauxite, gross weight		273,677	57,254	364,306[r]	366,000[r]	365,000
Alumina		--	101,339	102,785	137,002	150,000
Metal, primary ingot		146,000	168,715	182,477	212,602	220,000
Arsenic, orpiment and realgar, concentrates[e]		400	400	275	89[4]	100
Chromite, mine output, concentrate						
Gross weight		145,170	512,640	97,328	138,755	223,563[4]
Cr_2O_3 content[e]		69,000	250,000	48,000	68,000	110,000
Copper:						
Mine output:						
Ore mined (0.6% to 1.2% Cu):						
Gross weight	thousand metric tons	16,140	15,529	15,084	18,885	19,000
Cu content[e]		170,000	160,000	160,000	190,000	190,000
Concentrate (29% to 35% Cu):						
Gross weight		414,133	394,061	395,036	448,689	620,000
Cu content[e]		121,000	121,000	130,000	150,000	208,000
Metal:						
Smelter output, blister or anode		181,526	171,591	168,613	184,814	185,000
Refined output, cathode		152,703	143,438	145,669	152,463	152,000
Gold, mine output, Au content[5]	kilograms	192	210	203	195	200
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	13,978	16,906	18,287	18,205	19,000
Fe content[e]	do.	6,400	8,000	9,000	8,900	9,000
Metal:						
Pig iron[e]	do.	2,300	2,400	2,709[4]	2,136[4]	2,300
Direct-reduced iron	do.	5,000[e]	5,280	5,620	6,410	6,850
Ferrochromium[e]		8,430	8,000	10,000	7,750[4]	8,000
Ferrosilicon[e]		40,000	40,000	40,297[4]	50,140[4]	50,000
Steel, crude, ingots and castings	thousand metric tons	6,890	7,293	7,869	8,382	7,405[4]
Lead:						
Mine output, concentrate:						
Gross weight		39,093	38,054	39,093	42;018	43,000
Pb content[e]		19,000	19,000	20,000	22,000	22,000
Refinery output, includes secondary[e]		50,000[r]	51,000[r]	58,000[r]	68,000[r]	68,000
Manganese, mine output (30% to 35% Mn):						
Gross weight		120,994	123,148	115,680	128,924	125,000
Mn content[e]		40,000	42,000	38,000	43,000	42,000
Molybdenum, mine output, concentrate:						
Gross weight		4,506	4,271	4,084	3,367	3,800
Mo content[e]		2,400	2,300	2,200	1,800	2,000
Silver, mine output, Ag content		22	23	23	25	25
Zinc:						
Mine output, concentrate:						
Gross weight		250,000	220,000	222,000	244,006	250,000
Zn content[e]		120,000	120,000	110,000	121,000	125,000
Metal		73,000	82,571	78,428	109,400	120,000
INDUSTRIAL MINERALS						
Asbestos:						
Concentrate (3% to 8% marketable fiber)		75,000	70,000	98,000[r, e]	82,018	80,000
Marketable fiber[e]		2,000	1,500	1,470[4]	6,000	5,000

See footnotes at end of table.

TABLE 1--Continued
IRAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005[e]
INDUSTRIAL MINERALS--Continued						
Barite		195,539	178,652	196,169	275,607	280,000
Boron, borax		3,212	2,079	3,361	2,142	2,500
Cement, hydraulic	thousand metric tons	26,640	28,600	30,460	32,198	32,650 [4]
Clays:						
Bentonite		113,299	125,510	140,528	193,046	200,000
Industrial clays[e]		485,000 [4]	450,000 [r]	388,543 [r, 4]	578,750 [r, 4]	550,000
Kaolin		635,888	553,782	484,501	531,109	500,000
Diatomite		--	1,879	9,500	8,028	8,000
Feldspar		204,078	191,316	242,898	252,713	250,000
Fluorspar		54,486 [r]	32,006	47,730 [r]	54,052 [r]	54,000
Gemstones, turquoise[e]	kilograms	20,000	20,000	20,000	20,000	20,000
Gypsum	thousand metric tons	10,382	13,535	13,828	12,594	13,000
Industrial or glass sand (quartzite and silica)		1,781,532 [r]	1,878,867 [r]	1,964,965 [r]	1,880,093 [r]	1,900,000
Lime	thousand metric tons	2,000 [r]	2,200 [r]	2,300 [r]	2,500 [r]	2,500
Magnesite		133,778	128,565	87,795	88,194	88,000
Mica		3,255	2,845	5,500	7,032	7,000
Nepheline syenite		6,650	75,000	75,500	63,798	65,000
Nitrogen:						
N content of ammonia		1,086,700	1,119,100	1,115,100	1,087,700	1,020,000
N content of urea		651,000 [e]	732,700	734,200	717,800	670,000
Perlite		18,130	20,000	26,495	31,259	31,000
Phosphate rock:						
Ore		213,338	303,000	194,000	229,575	250,000
P_2O_5 content[e]		26,000	36,000	23,000	28,000	30,000
Pigments, mineral, natural iron oxide, ochre[e]		1,000 [4]	2,300 [4]	2,300	2,500	2,500
Pumice and related volcanic materials[e]		843,912 [r, 4]	1,181,543 [r, 4]	1,228,388 [r, 4]	1,536,448 [r, 4]	1,500,000
Salt		1,558,668	1,664,496	2,002,899	1,790,669	2,000,000
Soda ash[e]		120,000	120,000	120,000	130,000 [r]	130,000
Sodium compound, caustic soda[e]		20,000	22,000	22,000	22,000	22,000
Stone:						
Construction and building, crushed[6]	thousand metric tons	16,450	19,809	21,383	25,369	25,000
Dimension and decorative:						
Granite	do.	401	620	838	1,019	1,000
Marble, blocks and slabs[7]	do.	3,460	3,462	4,014	4,068	4,000
Travertine, blocks	do.	678	728	935	1,360	1,400
Total	do.	4,540	4,810	5,790	6,450	6,400
Dolomite	do.	223	439	522	609 [r]	600
Limestone[e]	do.	41,800	41,100	46,170 [r, 4]	50,380 [r, 4]	50,000
Strontium, celesite[e]		2,000	2,000	2,100 [4]	7,500 [4]	7,500
Sulfates, natural:[e]						
Aluminum potassium sulfate (alum)		10,000	10,000	1,000	1,000	1,000
Sodium sulfate		387,000 [4]	580,000	580,000	600,000	600,000
Sulfur:[e]						
Byproduct of petroleum and natural gas		880,000 [4]	1,200,000 [4]	1,310,000	1,400,000	1,400,000
Byproduct of metallurgical processing, S content of acid		50,000	50,000	50,000	60,000	60,000
Total		930,000	1,250,000	1,360,000	1,460,000	1,460,000
Talc		60,282	68,007	65,833 [r]	187,465 [r]	190,000
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand metric tons	1,981	2,076	1,902	2,498	2,500
Coke	do.	1,095	1,055	1,004	1,021	1,020

See footnotes at end of table.

TABLE 1--Continued
IRAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005[e]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Gas, natural:[e]						
Gross	million cubic meters	120,000	120,000	125,000	137,000	140,000
Dry	do.	66,000	75,000	81,500	89,663[4]	90,000
Plant liquids	thousand 42-gallon barrels	25,000	25,000	25,000	25,000	27,000
Petroleum:						
Crude	do.	1,350,000	1,250,000	1,366,000	1,399,000	1,350,000
Refinery products:[e]						
Liquefied petroleum gases	do.	16,000	16,000	16,000	17,000	17,000
Motor gasoline	do.	67,000	67,000	67,000	68,000	68,000
Jet fuel	do.	13,000	14,000	14,000	14,000	14,000
Kerosene	do.	44,000	46,000	46,000	46,000	46,000
Distillate fuel oil	do.	130,000	135,000	140,000	140,000	140,000
Residual fuel oil	do.	145,000	152,000	160,000	160,000	160,000
Other	do.	65,000	95,000	100,000	100,000	100,000
Total	do.	480,000	525,000	543,000	545,000	545,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through December 1, 2006.

[2] Data are for Iranian years ending March 20 of that stated, except data for alumina, natural gas, natural-gas-plant liquids, and petroleum, which are for Gregorian calendar years.

[3] In addition to commodities listed, the following may have been produced, but information is inadequte to estimate output: antimony, bromine, ferromolybdenum, nepheline syenite, phosphate rock, selenium, shell, silicomanganese, and zeolite.

[4] Reported figure.

[5] Includes gold recovered from the Mouteh gold mine and from the Sarcheshmeh copper complex.

[6] Includes marble and travertine.

[7] Includes marmarite.

TABLE 2
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Iran Aluminium Co. (Iranian Mines and Mining Development and Renovation Organization)[3]	Arak	120
Do.	Almahdi Aluminium Corp. (Iranian Mines and Mining Industries Development and Renovation Organization,[3] 59.34%, and International Development Corp., 20.78%)	Bandar Abbas	110
Cement	Abadeh Cement Co.	Abedeh	175
Do.	Abyek Cement Co. (Fars & Khouzestan Cement Co.)	Abyek, 80 kilometers northwest of Tehran	2,600
Do.	Ardebil Cement Co. (Ehdasse Sanat Corp.[4] and Holcim Ltd.)	About 20 kilometers from Astara	800
Do.	Behbahan Cement Co. (Fars & Khouzestan Cement Co.)	Behbahan	960
Do.	Benvid White Cement Co.	Benvid, Isfahan	175
Do.	Bojnourd Cement Plant (Fars & Khouzestan Cement Co.)	About 37 kilometers from Bojnourd	700
Do.	Bushehr Cement Co. (Ehdasse Sanat Corp.)[4]	Borazjan	1,100
Do.	Darab Cement Co. (Ehdasse Sanat Corp.)[4]	Near Shiraz	1,100
Do.	Doroud Cement Co. (Fars & Khouzestan Cement Co.)	Doroud	1,400
Do.	Ekbatan Cement Co.	Ekbatan	175
Do.	Estahban Cement Co.	Estahban	350
Do.	Fars Cement Co. (Fars & Khouzestan Cement Co.)	Fars	2,000
Do.	Ghaen Cement Co. (Fars & Khouzestan Cement Co.)	Ghaen	770
Do.	Gharb Cement Co. (Fars & Khouzestan Cement Co.)	Kermanshah	700
Do.	Gorgon Cement Co.	NA	640 [e]
Do.	Hegmatan Cement Co. (Tehran Cement Co.)	East of Razan	1,120
Do.	Hormozgan Cement Co. (Sepahan Cement Co.)	About 52 kilometers west of Bandar Abbas	2,200
Do.	Ilam Cement Co. (Tehran Cement Co.)	Ilam	700
Do.	Isfahan Cement Co.	Esfahan	1,100
Do.	Karoon Cement Co.	Karoon	1,050
Do.	Kerman Cement Co. (Bank Melli Iran Investment Co.)	Kerman	1,260
Do.	Khash Cement Co. (Fars & Khouzestan Cement Co.)	Khash	730 [e]
Do.	Khazar Cement Co. (Fars & Khouzestan Cement Co.)	Khazar	640 [e]
Do.	Khouzestan Cement Co. (Fars & Khouzestan Cement Co.)	Ramhormoz	1,100 [e]
Do.	Kordestan Cement Co. (Sepahan Cement Co.)	North of Bijar	800 [e]
Do.	Mazandaran Cement Co. (Bank Melli Iran Investment Co.)	Neka	700
Do.	Mashad Cement Co.	Mashad	1,000 [e]
Do.	Qayen Cement Co	Qayen	NA
Do.	Qeshm Cement Co.	Qeshm Island	250
Do.	Oroumiyeh Cement Co.	Uroumiyeh (Urumia)	740
Do.	Oroumiyeh White Cement Co.	do.	180 [e]
Do.	Neyriz White Cement Co. (Fars & Khouzestan Cement Co.)	Neyriz	160
Do.	Saveh White Cement Co. (State Retirement Organization[3])	Saveh	350
Do.	Sepahan Cement Co.	Sepahan	2,300
Do.	Shahroud Cement Co. (Sepahan Cement Co.)	Sharoud	600
Do.	Sharg Cement Co. (Sepahan Cement Co.)	Mashhad	1,600
Do.	Shomal Cement Co. (Bank Melli Iran Investment Co.)	Shomal	880
Do.	Simansaz (Loshan) Cement Co. (Tehran Cement Co.)	Loshan	200 [e]
Do.	Soufian Cement Co. (Tehran Cement Co.)	Sufiyan	1,500
Do.	Tehran Cement Co.	Tehran	6,000
Do.	Yazd Bohrouk Cement Co.	Yazd	1,260
Chromite	Faryab Mining Co.	Faryab Mine and processing plant, Minab, Hormuzgan	180 [e]
Do.	Esfandaghe Mines Co.	Abdasht Mine, Baft, Kerman and Suqan (Saboughan) Mine, Kerman; Processing plant at Esfandaghe, Kerman	30

See footnotes at end of table.

TABLE 2--Continued
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Chromite--Continued	NA	Furumad Mine, Shahrud, Semnan; Gaft processing plant, Semnan	6
Do.	NA	Mir Mahmud Mine, Mayami, Seman	6
Do.	NA	Dumak Mine, Zahedan, Sistan va Baluchestan	2
Do.	Other companies	Other mines	30 [e]
Coal	Kerman Coal Co. (Iranian Mineral Production & Supply Co., 100%)[4]	Includes the Ashkli, the Babnizo, the Badamouiyeh, the Eshkeli, the Hamkar, the Hojedk, the Kamsar, the Khoshooni (Hashouni), and the Pabdana Mines	1,300
Do.	Iranian Mineral Production & Supply Co.[4]	Parvadeh 3 and 4 Mines, Tabass, Khorasan	750 [5]
Do.	Zirab Coal Co. (Iranian Mineral Production & Supply Co., 100%)[4]	Gajereh, Goliran, and Zirab Mines, Mazandaran	600
Do.	Shahroud Coal Co. (Iranian Mineral Production & Supply Co., 100%)[4]	Shahroud Mine, Mazandaran; Razi and Tazareh Mines, Semnan	280
Do.	Western Alborz Coal Co. (Iranian Mineral Production & Supply Co., 100%)[4]	Abyek Mine, Qazvin; Sangroud Mine, Gilan	150
Do.	Fajr Mazinoy Cooperative Co.	East Mazinoy and West Mazinoy, Khorasan	8
Copper:			
Concentrate	National Iranian Copper Industries Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Sar Cheshmeh Mine, 60 kilometers south of Rafsanjan, Kerman	179
Do.	do.	Songun copper mine, Azarbaijan	45 [5]
Do.	do.	Meiduk copper mine, Kerman	34
Do.	do.	Qal'eh Zari Mine, near Birjand, Khorsan	10
Do.	Private cooperatives	Chah Musa Mine and Qal'eh Sukhteh, Semnan	5
Smelter output	National Iranian Copper Industries Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Smelter, Sar Cheshmeh copper complex	197
Do.	do.	Smelter, Khatounabad	96
Refined metal	do.	Refinery, Sar Cheshmeh copper complex	200
Do.	do.	Electrowon plant, Sar Cheshmeh copper complex	14
Ferroalloys:			
Ferrochromium	Kerman Ferrochrome Co.	Kerman	25
Do.	Iranian Mineral Production & Supply Co.[4]	Sabzevar, Khorasan	25
Do.	Faryab Mining Co.	Faryab, Kerman	15
Do.	Navid Alloy Co.	NA	2
Ferromanganese	Faryab Mining Co.	Faryab, Kerman	15 [e]
Ferromolybdenum	Pars Molybden Co.	Yazd, Yazd	1
Do.	National Iranian Copper Industries Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Khatounabad smelter	1.5 [e]
Do.	Zanjan Bronze Co.	NA	0.5 [e]
Ferrosilicon	Iran Ferroalloy Industries Co. (Bank of Industry and Mines, 100%)[3]	Azna, Lorestan	25
Do.	Iran Ferrosilice Co.	Semnan	25
Fluorspar	Private cooperative	Kamar Mehdi Mine, 165 kilometers southwest of Tabas	20 [e]
Do.	NA	Delijan Region Mines, 10 kilometers from Delijan, Markazi	6 [e]
Do.	NA	Kamarposht Mine, 20 kilometers from Zirab	5 [e]
Do.	NA	Emaft Mine, 30 kilometers from Zirab, Mazandaran	3 [e]
Do.	NA	Helali Gonabad Mine, 27 kilometers from Gonabad-Bajestan road	2 [e]
Do.	NA	Mahalat Mine, 5 kilometers from Mahalat, Markazi	2 [e]
Do.	NA	Pachi Miyana Mine, 30 kilometers from Zirab	2 [e]
Do.	NA	Jouimand Mine, 23 kilometers northwest of Gonabad, Khorasan	NA
Do.	NA	Derasele deposit	NA

See footnotes at end of table.

TABLE 2--Continued
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gemstones, turquoise		NA	Neyshabour Mine	6 [e]
Gold:				
Ore	kilograms	Iran Gold Co.	Muteh Mine (Chah Khaton and Senjedeh pits), Esfahan, and Kuh-e-Zar Mine, Semnan	600
Do.	do.	Artisanal placer operations	Neyshabour area	NA
Metal[6]	do.	National Iranian Copper Industries Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Sarcheshmeh Copper Complex, Kerman	500
Iron:				
Ore		Iran Central Iron Ore Co. (National Iranian Steel Co., 100%)[4]	Choghart Mine, Bafgh, Yazd	7,400
Do.		Chadormalou Mining and Industrial Co. (National Iranian Steel Co., 100%)[4]	Chadormalou Mine, 90 kilometers north of Tchogart	6,500
Do.		Gol-e-Gohar Iron Ore Co. (National Iranian Steel Co., 100%.)[4]	Gol-e-Ghar Mine, Kerman	3,800
Do.		Sangan Iron Ore Co. (National Iranian Steel Co., 100%)[4]	Sangan (Songun) Mine, Golestan	300
Do.		About 50 small privately owned mines	NA	1,000 [e]
Metal		Mobarekeh Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Direct-reduction iron plant (Midrex process) at Esfahan	3,200 [7]
Do.		Khouzestan Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Direct-reduction iron plant (HYL I, Midrex, and Purofer processes), Ahwaz	3,200
Do.		Isfahan Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Direct-reduction iron plant (Ghaem process) at Esfahan	600
Manganese		Iran Manganese Mines Co. (Takado Co.)	Venarch Manganese Mine, Qom	70
Do.		Taamin-e-Sange Manganeze Foolad-e-Iran	Robat Karin Mine, Tehran	NA
Do.		Qom Manganese Mines Co.	Shahrestouak Mine, Qom	3
Molybdenum		National Iranian Copper Industries Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Sarcheshmeh Copper Complex, Kerman	NA
Natural gas	billion cubic meters	National Iranian Oil Co. (Government, 100%)	Associated gas from company oilfields	96
Do.	do.	National Iranian Gas Co. (Government, 100%)	Aghar, Dalan, Kangan, and Nar gasfields	57
Do.	do.	Pars Oil and Gas Co. (National Iranian Oil Co., 100%)[3]	South Pars gasfields	32 [8]
Petroleum:				
Crude	million 42-gallon barrels	National Iranian Oil Co. (Government, 100%)	Onshore oilfields include the Agha Jari, the Ahwaz-Asmari, the Bangestan, the Hakimeh, the Gachsaran, the Karanj, the Marun, the Pazanan, and the Rag-e-Safid. Offshore oilfields include the Abouzar, and the Salman	1,400
Do.	do.	National Iranian Oil Co. and buy-back contract joint venture of Shell Iran Nowrooz/Soroosh Development (70%), JJI S&N B.V. (20%), and Iranian Offshore Engineering & Construction Co. (10%)	Nowrooz and Soroosh Fields, offshore	75
Do.	do.	National Iranian Oil Co. and buy-back contract joint venture of Total S.A. (55%) and Eni SpA (45%)	Doroud Field, offshore,	65
Do.	do.	National Iranian Oil Co. and buy-back contract joint venture of Total S.A. (70%) and PETRONAS Carigali International Sdn Bhd (30%)	Sirri A and E Fields, offshore	40
Do.	do.	National Iranian Oil Co. and buy-back contract joint venture of Total S.A. (60%) and Naftiran Intertrade Co. (40%)	Darquain Field, onshore	17
Refined products	thousand 42-gallon barrels per day	National Oil Refining and Distribution Co. (Government, 100%)	Refineries at Abadan, Arak, Bandar Abbas, Esfahan, Kermanshah, Lavan, Shiraz, Tabriz, and Tehran	1,728

See footnotes at end of table.

TABLE 2--Continued

IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Phosphate rock	Phosphate Mines Development Co. (Iranian Mines and Mining Industries Development and Renovation Organization, 100%)[3]	Esfordi Mine, Yazd	360
Do.	Chadormalou Mining and Industrial Co. (National Iranian Steel Co., 100%)[4]	Chador Malu Mine	NA
Do.	Other companies	Other mines	29
Steel, crude	Mobarekeh Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Plant at Esfahan	4,200
Do.	Isfahan Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Plant at Esfahan	2,900
Do.	Khouzestan Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Plant at Ahwaz	2,600
Do.	National Iranian Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization)[3]	Includes subsidiaries Iran National Steel Industrial Group plant at Ahwaz, and Khorasan Steel Co. plant near Neyshabur	1,500
Zinc:			
Ore	Angouran Mining Company (Iran Zinc Mine Development Co.)	Angouran Mine, Zanjan	500 [9]
Do.	BAMA Co.	Irankouh complex (Goosh-e-feel, Gowd-e-Zendan, Khaneh Gorgi, Kolah Darwazeh, and Tappeh Sorkhi Mines), Esfahan	190 [9]
Do.	Bafgh Mining Co.	Kushk Mine, Yazd	120 [9]
Refined metal	Bafgh Zinc Co. (Iran Zinc Mine Development Co.)	Bafgh, Yazd	30
Do.	Qeshm Zinc Smelter Co. (affiliate of Calcimin Co.)	Qeshm Island, Hormozgan	20
Do.	National Iranian Lead and Zinc Co. (Iran Zinc Mine Development Co.)	Zanjan	15
Do.	Calcimin Co. (Iran Zinc Mine Development Co.)	Dandi (Angouran) plant, Zanjan	14
Do.	Faravari Mavad Madani Iran Co. (Iran Zinc Mine Development Co.)	Zanjan	14
Do.	Bandar Abbas Zinc Production Co. (affiliate of Calcimin Co.)	Bandar Abbas	13
Do.	Zanjan Zinc Smelter Co. (affiliate of Calcimin Co.)	Zanjan	5

[e] Estimated. NA Not available.

[1] About 2,700 mines are located in Iran, about 2,000 of which are active. About 65% of the active mines and quarries produce building and construction materials, such as aggregate, sand, and stone.

[2] Data was augmented by input from the Iranian National Committee of the World Mining Congress.

[3] Government owned.

[4] A subsidiary of state-owned Iranian Mines and Mining Industries Development and Renovation Organization.

[5] Under construction.

[6] Recovered from Sar Chemesh copper plant slimes.

[7] An additional 800,000-metric-ton-per-year-capacity Midrex plant is under construction and expected to be operational in 2006.

[8] May include basic sediment and condensate.

[9] Includes lead and zinc ores.

THE MINERAL INDUSTRY OF IRAQ

By Philip M. Mobbs

Hydrocarbon production and processing dominated the national economy of Iraq. In 2005, oil production declined, and the economy of Iraq continued to be adversely affected by the post-conflict insurgency that has engulfed the country since 2003. Incoming oil revenue was not significantly affected because the resultant decline in the volume of Iraqi oil exports was offset by the increase in international crude oil prices in 2005. Iraq's gross domestic product (GDP) based on purchasing power parity was estimated to be about $94.1 billion in 2005, and the GDP per capita based on purchasing power parity was estimated to be $3,400. With the exception of cement, production of other mineral and mineral-based commodities was negligible (Knickmeyer, 2006; U.S. Central Intelligence Agency, 2006§[1]).

Problems with electrical power availability, security, and transportation impacted the rehabilitation of the country's industrial sector, especially mineral fuel production and processing. The lack of electrical power resulted in an increased demand for petroleum products to fuel small electrical-power generators, and attacks by insurgents on oil facilities resulted in decreased flow of crude oil to domestic refineries and export terminals.

As part of the Iraqi Government's agreement with the International Monetary Fund to reduce foreign debt, the Government had been expected to increase domestic prices of refined petroleum products in 2004; the Government, however, was restrained by political pressures. Domestic demand for diesel, gasoline, and kerosene increased in 2005 because of the need to refuel about 1 million more cars that had been imported into Iraq after the 2003 conflict and to supply gasoline- and kerosene-fueled electrical-power generators. In mid-2005, imported premium gasoline still sold for about 12.5 cents per gallon, locally-refined regular gasoline sold for about 4.9 cents per gallon, diesel fuel sold for about 2.6 cents per gallon, and kerosene sold for about 1.1 cents per gallon. Fuel prices in Iraq were considerably lower than those of other countries in the region, which resulted in the smuggling of significant volumes of petroleum products out of Iraq. In mid-December 2005, the Government announced that it would reduce the fuel subsidies; the price of premium gasoline was raised to about 65 cents per gallon and that of regular gasoline was increased to about 45 cents per gallon. The fuel price hikes resulted in armed attacks on fuel tankers and gasoline stations, widespread demonstrations, and labor strikes at the oil refineries (Finer and Nouri, 2005; International Monetary Fund, 2005, p. 10-11; Hernandez, 2006).

Commodity Review

Industrial Minerals

Cement.—In 2005, the Government issued licenses for the construction of 20 new cement plants. In northern Iraq, a consortium that was lead by Orascom Construction Industries of Egypt, and which included the Faruk Rasool Group (FRG) of Iraq and a company of the Polysius Group, continued the rehabilitation of the 2.3-million-metric-ton-per-year (Mt/yr)-capacity Tasluja cement plant. In 2004, prior to the start of the renovation, the effective capacity of the two-line plant was about 300,000 metric tons per year. Orascom, FRG, and Blair Sayed Magid of Iraq formed the United Cement Corp. of the British Virgin Islands, which proceeded to plan to build the 2.9-Mt/yr-capacity Bazian Cement Plant near Hayasi. The Tasluja plant was scheduled to resume full production in 2006. Initial production from the Bazian plant was expected to begin in late 2007 (Middle East Economic Digest, 2005a; Orascom Construction Industries, 2006).

Mineral Fuels

Petroleum.—In 2005, several oil companies undertook field or reservoir studies; evaluators included the joint venture of Anadarko Petroleum Corp. of the United States, the Dome Group of the United Arab Emirates, and the Vitol Group of the Netherlands and Switzerland for the Suba and the Luhais Fields; Crescent Petroleum Co. of the United Arab Emirates for the Amara, the Nur, and the Ratawi Fields; Exploration Consultants Ltd. of the United Kingdom and the Royal Dutch/Shell Group for the Kirkuk Field; BP p.l.c. of the United Kingdom for the Rumaila Field; Oil Exploration Co. of Iraq and Petrel Resources Plc of Ireland for the Merjan Field; and the K Petroleum Co. (a subsidiary of Heritage Erbil Oil Ltd., which was a subsidiary of the Eagle Group of Iraq and Heritage Oil Corp. of Canada) for the Taq Taq Field. Norsk Hydro ASA of Norway also agreed to assist the Ministry of Oil with field studies.

The Oil & Gas International Group of Canada secured the contract to develop the 80,000-barrel-per-day (bbl/d)-capacity Hamrin oilfield. Petrel was awarded the contract to redevelop the Suba and the Luhais Fields. Production from the Suba and the Luhais Fields was expected to be increased to more than 200,000 bbl/d from about 50,000 bbl/d. In late November, DNO ASA of Norway spudded the Tawke No. 1 exploration well in northern Iraq (Middle East Economic Digest, 2005b; Rigzone.com, 2005§).

The Government requested bids on the rehabilitation of various process units at the Baiji, the Kirkuk, and the Nasiriyah refineries, on the construction of a 70,000-bbl/d-capacity refinery in the Koya area, and on the construction of a 140,000-bbl/d-capacity refinery near Karbala that originally had been proposed to be built near Nahrain (Middle East Economic Digest, 2005c).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Outlook

According to the oil ministry, an estimated $6.25 billion was lost (oil revenue not earned and costs to repair damage) in 2005 because of 186 attacks on oil industry infrastructure that were attributed to insurgents. In response to the attacks, available funding was directed towards rehabilitation of existing infrastructure and associated security costs instead of new mineral sector development. In the near- and medium-term, the Iraq economy would benefit from improved security, increased oil production and exports, and continued strong world oil prices (Guardian, The, 2006§).

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TABLE 1

IRAQ: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2001	2002	2003	2004	2005
METALS						
Steel, crude		50	--	--	--	--
INDUSTRIAL MINERALS						
Cement, hydraulic:						
Portland		6,000	6,834 [4]	1,901 [4]	2,500	3,000
White		158	175	54 [4]	15	15
Nitrogen, N content of ammonia		280	532 [4]	-- [4]	30	30
Phosphate rock, beneficiated, phosphorus pentoxide content		100	100	10	1 [r]	1
Salt		300	203 [4]	50 [4]	50	25
Sulfur, elemental:						
Native, Frasch		300	300	50	--	--
Byproduct[5]		50	50	1	20	30
Total		350	350	51	20	30
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	7,000	7,000	4,000	5,000 [r]	4,000
Dry	do.	2,920	2,900	1,500	1,800 [r]	1,500
Natural gas plant liquids	thousand 42-gallon barrels	4,000	4,000	2,000	12,000 [r]	11,000
Petroleum:						
Crude, including lease condensate	do.	860,000	740,000	490,000	737,940 [4]	660,000
Refinery products	do.	170,000	170,000	50,000	50,000	100,000

[r] Revised. -- Zero.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through September 22, 2006.

[3] In addition to the commodities listed, secondary aluminum, clay, fertilizers, gypsum, secondary lead, lime, limestone, industrial (glass or silica) sand, sand and gravel, and stone also may have been produced but available information is inadequate to estimate output.

[4] Reported figure.

[5] From petroleum and natural gas processing.

THE MINERAL INDUSTRY OF ISRAEL

By Thomas R. Yager

Israel was the world's second ranked producer of bromine, the fifth ranked producer of potash, and the ninth ranked producer of phosphate rock in 2005. The country also produced such industrial minerals as flint clay, gypsum, kaolin, magnesia, silica sand, and sulfur and such metals and metal products as lead, magnesium, and steel. Building materials produced in Israel included cement, crushed stone, marble, and sand. Israel also cut imported diamond and other gemstones and produced natural gas, petroleum, and petroleum products (Jasinski, 2007; Kostick, 2007; Lyday, 2007).

In August 2005, Altos Hornos de México S.A. de C.V. (AHMSA) reached an agreement with the Government to reopen the Timna copper mines, which had been shut down for more than 20 years. AHMSA planned to spend $160 million to restart production, which was expected to be 45,000 metric tons per year (t/yr) of refined copper. All Timna's production was expected to be exported (Global Mining News, 2005).

Dead Sea Magnesium Ltd. (DSM) [Israel Chemicals Ltd. (ICL), 65%, and Volkswagen AG of Germany, 35%] was a producer of magnesium metal and magnesium alloys. In 2004 and 2005, the company produced about 28,000 metric tons (t) of magnesium metal compared with 26,000 t in 2003. North America accounted for 65% of DSM's sales, and Europe, 33% (Israel Chemicals Ltd., 2006, p. 87).

In 2005, Dead Sea Bromine Group (DSBG) (a subsidiary of ICL) produced about 207,000 t of bromine compared with 202,000 t in 2004 and 176,000 t in 2003. The company consumed about 75% of its bromine in the manufacture of bromine compounds. DSBG planned to increase its capacity to 280,000 t/yr in 2006 from 240,000 t/yr (Israel Chemicals Ltd., 2006, p. 48, 58).

Lime & Stone Production Company Ltd. operated 15 quarries that produced more than 15 million metric tons per year of aggregate. The company operated a quarry and factory that produced between 170,000 and 250,000 square meters per year of marble. Israel produced an estimated 38 million metric tons (Mt) of crushed stone in 2005 compared with 41 Mt in 2004; sand production increased to an estimated 7 Mt from 6 Mt (Dun & Bradstreet Israel Ltd., 2006§[1], Housing & Construction Holding Company Ltd., undated§).

Lime & Stone also produced 100,000 t/yr of lime. Negev Industrial Minerals Ltd. (NIM) (a subsidiary of Doraz D.R.) resumed mining of flint clay in 2005; the company also produced gypsum, lime, limestone, quartz, and silica sand. Phoenicia America-Israel (Flat Glass) Ltd. purchased between 270 and 290 metric tons per day of silica sand from NIM for use in the production of float and pattern glass (Housing & Construction Holding Company Ltd., undated§).

Mining of phosphate rock by Rotem Amfert Negev Ltd. (a subsidiary of ICL) increased to about 3 Mt in 2005 from 2.9 Mt in 2004. In 2005, Rotem consumed about 90% of its output in the manufacture of phosphate fertilizers and phosphoric acid. The company was building a new plant to produce monoammonium phosphate at Mishor Rotem (Israel Chemicals Ltd., 2006, p. 23, 29; Sharbel Shehadeh, Ministry of National Infrastructures, written commun., November 17, 2006).

Dead Sea Works (DSW) (a subsidiary of ICL) increased its domestic potash production to 2.26 Mt in 2005 from 2.17 Mt in 2004. By 2008, DSW planned to increase its potash production capacity by using fewer of its brine ponds for salt precipitation and more for carnallite precipitation (Israel Chemicals Ltd., 2006, p. 22; Sharbel Shehadeh, Ministry of National Infrastructures, written commun., November 17, 2006).

Salt was produced by DSW and Israel Salt Industries Ltd.; the latter company produced more than 200,000 t/yr of salt. National salt production was 406,000 t in 2005 compared with 385,000 t in 2004 (Harben, 2005).

In 2005, production of natural gas rose to 1.66 billion cubic meters from 1.19 billion cubic meters in 2004 because of higher output from the Mari-B gasfield in the Mediterranean Sea. Noble Energy Inc. and its partners increased their sales to Israel Electric Corporation Ltd. from Mari-B because of the conversion of the Eshkol power station to natural gas. The companies also started supplying the petroleum refinery in Ashdod in the fourth quarter of 2005. Sales to other industrial customers that included a desalination plant and a paper mill were expected to start in 2007 (Noble Energy Inc., 2006, p. 5).

Outlook

The outlook for Israel's bromine, lead, magnesium, phosphate, potash, and salt industries depends heavily upon world market conditions for these commodities. The cement, crushed stone, gypsum, lime, marble, and natural gas industries, however, depend mainly upon the strength of the Israeli economy.

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TABLE 1
ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005
METALS						
Iron and steel, steel, crude[e]		220,000	150,000	150,000	280,000	350,000
Lead, refined secondary		20,000	22,000	25,000	27,000	27,000 [e]
Magnesium metal		34,000	26,000	26,000	28,000	27,853
INDUSTRIAL MINERALS						
Bromine, elemental		200,000 [e]	185,000	176,000	202,000	207,048
Caustic soda[e]		47,000	54,000	57,000	64,000	64,000
Cement, hydraulic	thousand metric tons	4,700	4,584	4,632	4,494	5,093
Clays:						
Brick clay		36,000 [e]	35,672	36,256	65,732	54,586
Flint clay	cubic meters	-- [e]	--	--	--	2,200
Fuller's earth		NA	998,193	892,658	850,000	1,072,491
Diamond[3]	thousand carats	1,367	1,188	771	770 [e]	770 [e]
Gypsum		130,000 [r, e]	123,119 [r]	141,000 [r]	124,678 [r]	106,798
Lime		550,000 [r, e]	751,857	702,373	113,102 [r]	165,894
Magnesia, Mg content[e]		55,000	50,000	45,000	40,000	40,000
Phosphate:						
Phosphate rock, mine output:						
Beneficiated	thousand metric tons	3,511	3,400 [r]	3,300 [r]	2,900 [r]	3,000
P_2O_5 content	do.	1,115	900 [r]	900 [r]	800 [r]	800
Phosphatic fertilizers, P_2O_5 equivalent:						
Monoammonium phosphate		13,000	13,000	12,000	12,000	12,000 [e]
Triple superphosphate		94,000	108,000	202,000	170,000	160,000 [e]
Phosphoric acid, P_2O_5 equivalent		561,000	567,000	580,000	543,000	520,000 [e]
Potash, K_2O equivalent	thousand metric tons	1,770	1,950 [r]	1,990 [r]	2,170 [r]	2,260
Salt marketed[e]	do.	460	392	376	385 [4]	406 [4]
Sand:						
Silica sand		250,000 [e]	209,347	210,815	196,330	196,254
Other[e]	thousand metric tons	8,000	6,000	6,000	6,000	7,000
Stone:						
Crushed[e]	do.	40,000	49,000	44,000	41,000	38,000
Dimension, marble		120,000 [e]	106,302	68,605	30,045 [r]	35,829
Sulfur:						
Byproduct from petroleum	thousand metric tons	35	36	45	42	44
Sulfuric acid:						
Gross weight	do.	1,900	1,956	1,894	1,789	1,700
S content	do.	621	639	619	581	550
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural, dry	million cubic meters	10 [e]	9	8	1,193	1,655
Petroleum:						
Oil shales		415,000	457,900	436,500	439,200	428,900
Crude	42-gallon barrels	29,800	33,438 [r]	27,396 [r]	23,135 [r]	22,835
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	6,045	5,591	5,500	6,170	5,650
Gasoline	do.	16,911	18,863	19,034	21,046	21,114
Naphtha	do.	7,089	3,798	4,376	3,722	4,066
Kerosene	do.	8,195	7,886	8,639	8,555	9,549
Distillate fuel oil	do.	23,424	21,169	22,208	20,516	22,433
Residual fuel oil	do.	23,787	22,432	22,910	11,880	16,850
Other	do.	1,959	2,007	2,151	1,835	1,696
Total	do.	87,410	81,746	84,818	73,724	81,358

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through November 30, 2006.

[2] In addition to the commodities listed, imported gemstones are cut; and potassium nitrate, secondary refined zinc, such fertilizers as monopotassium phosphate, and a variety of crude construction materials are produced, but available information is inadequate to make estimates of output.

[3] Imported diamond cut in Israel.

[4] Reported figure.

TABLE 2
ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aggregates		Lime & Stone Production Company Ltd. (Housing & Construction Holding Company Ltd., 50%, and Readymix (Israel) Ltd., 50%)	15 quarries	15,000.[e]
Bromine		Dead Sea Bromine Group (DSBG) (Israel Chemicals Ltd. (ICL), 100%)	Sdom	240.
Cement		Nesher Israel Cement Enterprises Ltd. (Clal Industries and Investments Ltd., 75%)	Ramla	5,000 clinker; 3,600 cement.
Do.		do.	Haifa	2,000 clinker; 450 cement.
Do.		do.	Har Tuv	1,000 clinker; 700 cement.
Flint clay and quartz		Negev Industrial Minerals Ltd. (NIM) (Doraz D.R.)	Mactesh Ramon	25.
Lead, refined, secondary		Harkunas Lead Works	Ashdod	25.
Lime		Lime & Stone Production Co. Ltd.	NA	170.
Do.		Negev Industrial Minerals Ltd. (NIM)	Mishor Rotem	90.
Magnesium:				
Magnesia		Dead Sea Periclase Ltd. (DSP) (Israel Chemicals Ltd., 100%)	do.	95.
Do.		Tateho Dead Sea Fused Magnesia Co. (DSP, 50%, and Tateho Chemical Industries Co. of Japan, 50%)	do.	13.
Magnesium, refined		Dead Sea Magnesium Ltd. (Israel Chemicals Ltd., 65%, and Volkswagen AG of Germany, 35%)	Sdom	34.
Natural gas	million cubic meters	Samedan, Mediterranean Sea Inc. (Noble Energy Inc., 100%)	Mari-B gasfield	6,200.
Petroleum:				
Crude	thousand 42-gallon barrels	Lapidoth Israel Oil Prospectors Corp.	Heletz-Brur	22.
Do.	do.	do.	Kochav	9.
Refined	do.	Oil Refineries Ltd. (Government, 100%)	Haifa	58,400.
Do.	do.	do.	Ashdod	36,500.
Potash		Dead Sea Works (DSW) (Israel Chemicals Ltd., 100%)	Sdom	2,800.
Phosphate:				
Phosphate rock		Rotem Amfert Negev Ltd. (Israel Chemicals Ltd., 100%)	Arad, Oron, and Zin	4,500.
Phosphatic fertilizers		do.	Rotem	1,700.
Do.		Haifa Chemicals Ltd.	Haifa	NA.
Phosphoric acid[1]		Rotem Amfert Negev Ltd.	Rotem	640.
Do.		Haifa Chemicals Ltd.	Haifa	NA.
Salt		Dead Sea Works (DSW)	Sdom	700.
Do.		Israel Salt Industries Ltd. (subsidiary of Danker Group)	Eliat	150.
Do.		do.	Kalia	60.
Do.		do.	Atlit	16.
Sand		Negev Industrial Minerals Ltd. (NIM)	Mactesh Htira	300.
Steel:				
Crude		Hod Metals	Akko	300.
Do.		Yehuda Steel Ltd.	Ashdod	180.
Billet		do.	Bene Ayish	200.
Do.		do.	Ashdod	180.
Rebar		do.	Bene Ayish	200.
Do.		do.	Ashdod	120.
Do.		Hod Metals	Kiryat Gat	300.
Sulfur		Oil Refineries Ltd.	Ashdod	40.
Do.		do.	Haifa	33.
Sulfuric acid		Rotem Amfert Negev Ltd.	Rotem	NA.
Zinc		Numinor Chemical Industries Ltd.	Maalot	NA.

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] P_2O_5 equivalent.

THE MINERAL INDUSTRY OF JORDAN

By Thomas R. Yager

In 2005, Jordan was the world's sixth ranked producer of phosphate rock and potash. It also produced such industrial minerals as bromine, feldspar, gypsum, kaolin, salt, and silica sand and such building materials as cement, dimension stone, limestone, and marble. Natural gas and petroleum products were produced for domestic consumption. Deposits of copper, gold, iron ore, sulfur, and titanium were also found in Jordan (Jasinski, 2007; Kostick, 2007).

In 2005, Jordan's nominal gross domestic product (GDP) amounted to about $28 billion based on purchasing power parity. The per capita GDP based on purchasing power parity was about $4,800. Jordan's real GDP grew by 7.2% in 2005 and 7.7% in 2004. In 2004, the output of the manufacturing sector amounted to 20.6% of the GDP; construction, 5.4%; electricity and water, 2.5%; and mining and quarrying, 2.4% (Central Bank of Jordan, undated, p. 83; International Monetary Fund, 2006§[1]).

In 2005, total exports were valued at $3.63 billion, of which $717 million were fertilizers, phosphate rock, phosphoric acid, and potash. Total imports were valued at $10.5 billion, of which imports of crude petroleum amounted to $1.71 billion; refined petroleum products, $449 million; and iron and steel products, $449 million (Central Bank of Jordan, undated, p. 102, 104).

Commodity Review

Metals

Iron and Steel.—Jordan Steel Company was the leading domestic producer of steel. In 2005, the company's production increased to 160,000 metric tons (t) from 121,000 t in 2004 and 97,000 t in 2003 because of higher demand in domestic and foreign markets. Jordan Steel and Consolidated Jordanian Iron and Steel Industry Ltd. started a joint venture to build a new plant to remelt scrap steel. The planned capacity of the plant was 270,000 metric tons per year (t/yr); the project was expected to be completed in the first half of 2007 at a cost of $34 million (Jordan Investment Trust plc, 2006; Arab Steel, 2005§, 2006§).

The completion of the new plant would eliminate Jordan Steel's dependence upon imported billet. In 2005, the value of iron and steel imports rose to $449 million from $356 million in 2004 and $214 million in 2001 (Central Bank of Jordan, undated, p. 104; Arab Steel, 2006§).

Industrial Minerals

Bromine.—Jordan Bromine Company [a joint venture of Arab Potash Company Ltd. (APC) and Albemarle Corp. of the United States] produced bromine, calcium bromide, and sodium bromide at its plant at al-Safi on the Dead Sea. Bromine production was an estimated 50,000 t in 2005 compared with 46,000 t in 2004 (table 1).

Cement.—National cement production rose to nearly 4.05 million metric tons (Mt) in 2005 from 3.91 Mt in 2004. Jordan Cement Factories Company Ltd. (JCFC) had two plants with a combined capacity of 4.2 million metric tons per year (Mt/yr). Growth in the domestic construction sector led to higher consumption of cement in 2005; JCFC reduced its exports and increased its output to meet demand. The company planned to increase its capacity to 5.5 Mt/yr in 2008 by upgrading existing production lines and installing a new production line at the Rashadiah plant (Allaf, 2006).

In early 2005, the Kuwaiti-Jordanian Finance Company announced plans to establish a new cement plant in southeastern Jordan. The plant was expected to have a capacity of 1.5 Mt/yr and to be completed in 2008 at a cost of $230 million. The company planned to sell its cement domestically and to export it to markets in Iraq, the Palestinian Authority, Saudi Arabia, and Syria (Allaf, 2006).

Al-Hasa Company for Cement and Building Materials Industries Ltd. planned to complete a new cement plant near Al-Hassa. The plant was expected to have a capacity of 1.5 Mt/yr and to be completed in early 2007 at a cost of $240 million. Arabian Cement Company Ltd. was also considering a joint venture with a Jordanian investor for the development of two new plants to produce portland and white cement. The portland cement plant was expected to have a capacity of 2 Mt/yr, and the white cement plant, 200,000 t/yr (Allaf, 2006).

Magnesium Compounds.—In December 2004, Jordan Magnesia Company (a subsidiary of APC) shut down the production of magnesia from the Dead Sea's resources of magnesium chloride. The company planned to carry out scheduled maintenance. By April 2005, production had not resumed because of technical problems with plant equipment; Jordan Magnesia did not announce a date for restarting the plant (O'Driscoll, 2005).

Phosphate Rock.—The Jordan Phosphate Mines Company (JPMC) produced phosphate rock at al-Abiad, al-Hassa, and the Eshidiya Mines. In 2005, phosphate rock production rose to nearly 6.38 Mt in 2005 from 6.22 Mt in 2004. National exports of phosphate rock amounted to $168 million in 2005 compared with $166 million in 2004 and $128 million in 2001 (Central Bank of Jordan, undated, p. 102).

Phosphoric acid was produced by the Indo-Jordan Chemicals Company (IJC) and JPMC. IJC consumed about 850,000 t/yr of phosphate rock from the Eshidiya Mine and exported its output to India. About 80% of JPMC's phosphoric acid was consumed in the production of diammonium phosphate (DAP) fertilizer. From 2001 to 2005, exports of phosphoric acid rose to $98.3 million from $52.2 million (Arab Petroleum Research Center, 2004; Central Bank of Jordan, undated, p. 102).

JPMC had a DAP plant with a capacity of 750,000 t/yr. Nippon Jordan Fertilizer Company (NJFC) also produced DAP and other fertilizers at Aqaba and exported its output to Japan. In 2005, Jordan's exports of fertilizers were valued at $173 million compared with $175 million in 2004 and $86.3 million in 2001 (Central Bank of Jordan, undated, p. 102).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Potash.—APC was one of the world's leading potash producers. In 2005, the company's production declined to 1.83 Mt from 1.93 Mt because of maintenance and rehabilitation, problems with salt mushrooms, and harvesting operation difficulties. APC planned to increase capacity to 2.45 Mt/yr from about 1.95 Mt/yr by mid-2008 (Arab Potash Company Ltd., 2006, p. 8, 26).

Most of APC's potash production was exported; about 10% of sales was to domestic customers. Exports of potash were $277 million in 2005 compared with $231 million in 2004 and $195 million in 2001. India accounted for 33% of APC's total potash sales; China, 12%; Malaysia, 7%; and Indonesia, 3% (Arab Potash Company Ltd., 2006, p. 22; Central Bank of Jordan, undated, p. 102).

Kemira Arab Potash Company (a joint venture of APC and Kemira) produced potassium nitrate fertilizer and dicalcium phosphate animal feed supplement. Production was below capacity in 2005; the company also had difficulty meeting required specifications for its products. In 2005, consumption of potash from APC increased to 88,000 t from 50,000 t in 2004 (Arab Potash Company Ltd., 2006, p. 23, 28).

Mineral Fuels

Natural Gas.—The Jordanian National Petroleum Company produced natural gas at the Risha gasfield; the majority of the country's natural gas was imported from Syria. In September 2005, Petrel Resources plc of Ireland signed a production-sharing agreement with the Government for the East Sawafi Block in eastern Jordan, which was prospective for natural gas and petroleum (Petrel Resources plc, 2005).

Petroleum.—Although minimal production at the Hamza oilfield on the Azraq Block continued in 2005, Jordan depended upon imports for most of its petroleum requirements. Imports of crude petroleum increased to $1.71 billion in 2005 from $1.08 billion in 2004 and $545 million in 2001. In 2005, Sonoran Energy Inc. of the United States signed a production-sharing agreement with the Government for the Azraq Block (Pepper, 2005; Central Bank of Jordan, undated, p. 104).

The Jordan Petroleum Refinery Company (JPRC) operated Jordan's only refinery at Zarqa. The company produced at nearly 114% of its rated capacity in 2005. JPRC planned to expand the refinery to a capacity of 140,000 barrels per day (bbl/d) from 100,000 bbl/d and to reduce the sulfur content of its products. The expansion and upgrades were expected to be completed by 2010 at a cost of between $750 million and $800 million. In 2005, imports of petroleum products increased to $449 million from $292 million in 2004 and $113 million in 2001 (Ghawi, 2005; Central Bank of Jordan, undated, p. 104).

Infrastructure

Jordan produced 9,654 gigawatt-hours (GWh) of electricity in 2005 compared with 8,967 GWh in 2004; imports rose to 982 GWh from 826 GWh. About 7% of domestic electricity was generated from the gas-fired plant at Risha. Installed generating capacity was 2,019 megawatts (MW) in 2005. National consumption of electricity was 8,712 GWh in 2005. Producers of cement consumed 409 GWh; potash, 278 GWh; fertilizers, phosphoric acid, and sulfuric acid, 203 GWh; phosphate rock, 115 GWh; refined petroleum products, 105 GWh; and bromine, 60 GWh. Peak demand was 1,751 MW of capacity in 2005 and was expected to rise to 2,339 MW in 2010, 2,856 MW in 2015, and 3,289 MW in 2020 (National Electric Power Company, undated, p. 24, 28, 35).

Outlook

Jordan's economy was expected to grow by 5% in 2006 and 2007. The strength of the domestic economy could lead to higher demand for cement, dimension stone, sand and gravel, and steel. JCFC expected that its domestic cement sales would increase to between 4.3 Mt and 4.5 Mt in 2006 from 3.9 Mt in 2005 (Allaf, 2006). The outlook for bromine, magnesia, phosphate rock, and potash depended heavily upon world market conditions.

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TABLE 1
JORDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[e]
Bromine		--	--	--	46,000	50,000
Cement, hydraulic	thousand metric tons	3,173	3,558	3,515	3,908	4,046 [2]
Clay:						
Common clay		300,000 [e]	400,000 [e]	492,583	608,390	610,000
Kaolin		24,124	100,000 [e]	179,153	216,566	220,000
Zeolite tuff		7,500 [e]	5,000 [e]	2,710	2,790	2,800
Feldspar		611	530	13,057	13,060	13,000
Gypsum		86,012	11,252	63,895	135,331	140,000
Lime[e]		6,000	8,000	10,108 [2]	7,154 [2]	7,200
Magnesia		--	--	--	22,000	--
Natural gas, dry	million cubic meters	278	255	288	294	300
Petroleum:						
Crude	42-gallon barrels	11,800	11,000	9,839	8,480	8,000
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	1,606	1,577	1,485	1,299 [r]	1,400
Gasoline	do.	5,465	5,383	5,084	4,938 [r]	5,300
Jet fuel	do.	1,693	1,650	2,109	1,578 [r]	1,700
Kerosene	do.	1,398	1,608	1,484	1,252 [r]	1,300
Distillate fuel oil	do.	7,456	8,139	8,579	9,116 [r]	9,700
Residual fuel oil	do.	8,564	7,911	7,759	10,097 [r]	11,000
Asphalt	do.	821	1,066	1,200	1,300 [e]	1,400 [e]
Total	do.	27,003	27,334	27,700	29,600 [r, e]	31,800
Phosphate:						
Phosphate rock, mine output:						
Gross weight	thousand metric tons	5,878 [r]	7,107 [r]	6,762	6,223	6,375 [2]
P_2O_5 content	do.	1,940 [r]	2,350 [r]	2,230	2,050	2,100
P_2O_5 equivalent:						
Diammonium phosphate		256,000	267,000	210,000	293,000	300,000
Phosphoric acid		482,000	594,000	563,000	566,000	550,000
Potash:						
Crude salts	thousand metric tons	1,962 [r]	1,956	1,961	1,929	1,830 [2]
K_2O equivalent	do.	1,195 [r]	1,191 [r]	1,190 [r]	1,175 [r]	1,115 [2]
Salt		329,000	406,652	11,976	28,700	29,000
Sand:						
Silica		90,000 [e]	60,000 [e]	33,100	46,000	46,000
Other	thousand metric tons	NA	NA	8,349	17,320	18,000
Steel:[e]						
Crude		30,000	134,000 [2]	135,000 [2]	140,000	140,000
Semimanufactured		290,000	290,000	290,000	310,000	350,000
Stone:						
Dimension, worked	thousand meters	7,000 [e]	10,000 [e]	13,578	6,560	6,600
Gravel and crushed rock	thousand cubic meters	11,000 [e]	13,000 [e]	14,266	14,900	15,000
Limestone[e]	do.	8,400	9,600	9,500	9,500	9,500
Marble	cubic meters	21,000 [e]	21,000 [e]	20,685	27,650	28,000
Sulfuric acid:						
Gross weight	thousand metric tons	1,650	1,800	1,650	1,790	1,700
S content	do.	539	588	539	585	560

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through November 30, 2006.

[2] Reported figure.

TABLE 2
JORDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies	Location of main facilities	Annual capacity
Bromine		Jordan Bromine Company (Arab Potash Company Ltd., 50%, and Albemarle Corp., 50%)	al-Safi	50.
Cement		Jordan Cement Factories Company Ltd. (LaFarge Group, 48.1%)	Fuheis and Rashadia	4,200.
Do.		Arab Company for White Cement Industry	Amman	130.
Magnesia		Jordan Magnesia Company (Arab Potash Company Ltd., 55.8%)	al-Safi	60.
Natural gas	million cubic meters	National Petroleum Company (Government, 100%)	Risha	460.
Petroleum:				
Crude	thousand 42-gallon barrels	National Petroleum Company	Hamza	NA.
Refined	do.	Jordan Petroleum Refinery Company	Zarqa	36,500.
Phosphate:				
Phosphate rock		Jordan Phosphate Mines Company (Jordan Investment Corp., 41.5%; Social Security Corp., 27.8%; Kuwait Investment Corp., 15.9%)	Al-Abiad, Al-Hassa, and Eshidiya Mines	7,000.
Phosphatic fertilizers		Jordan Phosphates Mines Company	Aqaba	750 DAP.[1]
Do.		Nippon Jordan Fertilizer Company (Asahi Industries Company, Ltd., Mitsubishi Corp., Mitsubishi Kasei Corp., and Zen-Noh, 60%; Arab Potash Company Ltd., 20%; Jordan Phosphate Mines Company, 20%)	Eshidiya	100 DAP; 200 other.
Phosphoric acid[2]		Jordan Phosphates Mines Company	Aqaba	432.
Do.[2]		Indo-Jordan Chemicals Company (Southern Petrochemical Industries Corp. Ltd., 52.2%; Jordan Phosphate Mines Company 34.8%; Arab Investment Co., 13%)	Eshidiya	225.
Potash		Arab Potash Company Ltd. (Potash Corp. of Saskatchewan, 27.7%; Government of Jordan, 26.9%; Arab Mining Co., 19.5%)	al-Safi	1,950.
Potassium nitrate		Kemira Arab Potash Company (Arab Potash Company Ltd., 50%, and Kemira Danmark A/S, 50%)	Aqaba	150.
Salt		al-Azraq	Azraq	NA.
Sand, silica		Middle Eastern Regional Development Enterprises	Ras al-Naqab	530.
Steel:				
Crude		Jordan Steel Company	Amman	300.
Semimanufactured		do.	do.	300.
Do.		National Steel Industry Co.	Awajan	100.
Do.		Other steel producers	NA	506.
Sulfuric acid		Jordan Phosphates Mines Company	Aqaba	1,785.
Do.		Indo-Jordan Chemicals Company	Eshidiya	660.

NA Not available.

[1] Diammonium phosphate.

[2] Expressed in phosphorus pentoxide (P_2O_5) equivalent.

Google

THE MINERAL INDUSTRY OF KUWAIT

By Philip M. Mobbs

Kuwait's economy revolved around the production and the refining of hydrocarbons. The hydrocarbon sector, which accounted for about 94% of Government revenue, employed about 2% of the nation's population, which was about 2.9 million. The International Monetary Fund (2006§[1]) estimated that the gross domestic product (GDP) based on purchasing power parity was $46.7 billion in 2005 and that the GDP per capita based on purchasing power parity was $16,301 (Mansur and others, 2006, p. 16; Central Bank of Kuwait, 2006§).

Trade

A majority of Kuwait's exports and imports was transported by sea. In 2005, total exports (free on board) were valued at $45 billion,[2] of which oil exports accounted for about $42.6 billion and manufactured fertilizer exports (ammonia, ammonium sulfate, sulfuric acid, and urea), $192 million. In 2004, the revised value of total exports was $28.6 billion, of which oil exports accounted for about $26.8 billion and manufactured fertilizer exports, $140 million. The increased international market price of crude oil accounted for most of the 57% increase in the value of Kuwaiti exports in 2005 compared with that of 2004. Total imports (cost, insurance, and freight paid to point of destination) in 2005 were estimated to be about $16.3 billion compared with about $12.7 billion in 2004 (Central Bank of Kuwait, 2006§).

Commodity Review

Metals

Iron and Steel.—The continued regional construction boom resulted in increased demand for the concrete-reinforcing steel bars produced by United Steel Industrial Company. In 2005, output increased by 30% to about 480,000 metric tons (t). The company planned to increase its capacity and its output to about 650,000 t in 2006. United Steel also proposed to build a 1-million-metric-ton-per-year (Mt/yr)-capacity rolling mill to produce steel billet, which would replace imported billet that was used to feed the bar mill (MEsteel.com, 2006§).

Industrial Minerals

Sulfur.—The sulfur recovery capacity of the proposed Al-Zour crude oil refinery was expected to be 4,000 metric tons per day. Kuwait National Petroleum Co. K.S.C. (KNPC), which was a subsidiary of Kuwait Petroleum Corp., also planned to install additional sulfur extraction units at the Mina Abdulla refinery (Middle East Economic Digest, 2005d).

Mineral Fuels

Natural Gas.—Domestic Kuwaiti natural gas production was insufficient to meet the demand of the industrial and power sectors, and output volumes varied year to year because Kuwaiti gas production associated with crude oil production was subject to production quotas of the Organization of the Petroleum Exporting Countries.

KNPC planned to build a new gas fractionation unit at Minal Al-Ahmadi. The new unit would handle the expected natural gas flow from the planned development of the offshore Dorra gasfield (Middle East Economic Digest, 2005c).

Rehabilitation of a gas pipeline to Iraq was underway. The initial import of about 1 million cubic meters per day of natural gas from Iraq, which originally was expected to start in 2005, was rescheduled to begin by late 2006. In 2005, the Ministry of Energy continued negotiations to import natural gas through a proposed subsea pipeline from Iran. The Ministry of Energy cancelled the proposed purchase of 8 billion to 15 billion cubic meters per year of natural gas from Qatar after the Saudi Arabian Government refused to allow the transit across its territory of an offshore natural gas pipeline to Kuwait from Qatar (Platts, 2006§).

Petroleum.—The National Assembly's scheduled January 23, 2006, debate on Project Kuwait [a proposed $7 billion project to expand production by foreign oil companies at five oilfields in northern Kuwait to about 900,000 barrels per day (bbl/d) from 450,000 bbl/d] was postponed when the Assembly's finance committee report on the project was withdrawn in December 2005. The January 2005 commissioning of Gathering Center (GC) 15 resulted in a 24% increase in crude oil production from the oilfields in northern Kuwait to about 520,000 bbl/d from 418,000 bbl/d in 2004. Natural gas, sediment, and water were separated from crude oil at the gathering centers. The expansion of GC 27 to 190,000 bbl/d from 150,000 bbl/d was underway. Kuwait Oil Co. K.S.C. proposed to rebuild GC 24 at Sabiya to handle additional output from the North Fields and to expand its handling capacity to 200,000 bbl/d; the company also proposed to rebuild the 160,000-bbl/d-capacity GC 29 to handle additional oil from the South and East Fields (Kuwait Oil Co. K.S.C., 2005, p. 15; Middle East Economic Digest, 2005a).

Saudi Arabian Texaco Inc. operated part of the Wafra Field in the partitioned neutral zone for Saudi Arabia. In 2005, Saudi Arabian Texaco completed facilities for a secondary recovery pilot project (steamflood) and planned to drill about 25 production wells and 16 steam injection wells.

In 2005, Kuwait Oil awarded a $1.2 billion contract to Hyundai Heavy Industries Co. Ltd. of the Republic of Korea for the Ahmadi crude oil export facility and a $220 million contract to Tekfen Construction and Installation Co., Inc. of Turkey for a 4.9-million-barrel (Mbbl) storage-tank farm at Ahmadi. The Hyundai contact included the construction of two additional storage-tank farms at Ahmadi, with a total capacity of 11.4 Mbbl; an additional oil loading pier; sundry pipelines; and two additional single-point-mooring buoys (Middle East Economic Digest, 2005b).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Where necessary, values have been converted from Kuwaiti dinars (KD) to U.S. dollars (US$) at the rate of KD0.292=US$1.00 for 2005 and KD0.294=US$1.00 for 2004.

In 2005, KNPC significantly revised its planned fourth refinery. Originally proposed as a 450,000 bbl/d facility adjacent to the Shuaiba Refinery, the planned new refinery was relocated south to Al-Zour (away from the suburbs that surround the Shuaiba Industrial Area), and the refinery's capacity was expanded to 615,000 bbl/d. The lack of infrastructure at the new site increased the anticipated cost of the new refinery to $6.3 billion. KNPC expected to decommission the Shuaiba Refinery after the scheduled 2010 opening of the Al-Zour Refinery (James, 2005).

Outlook

Crude and refined oil is expected to remain the focal point of Kuwait's mineral industry.

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TABLE 1
KUWAIT: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002[e]	2003[e]	2004[e]	2005[e]
Cement		920,700	1,584,000[3]	1,863,400[r]	2,635,000[r, 3]	2,700,000
Iron and steel, rolled steel bar		--	70,000	150,000	369,000	480,000
Lime, hydrated and quicklime[e]		40,000	40,000	40,000	40,000	49,800[3]
Natural gas:[e, 4]						
Gross	million cubic meters	11,200[r]	9,900	11,000[r]	11,860[r]	13,300
Dry	do.	9,500	8,100[r]	9,100[r]	9,800[r]	11,000
Nitrogen:						
N content of ammonia		400,000	414,400[3]	444,400[3]	413,400[3]	466,570[3]
N content of urea		290,000	320,000	330,000	341,020[r, 3]	365,350[3]
Petroleum:						
Crude[4]	thousand 42-gallon barrels	745,000	680,000	817,000	837,655[r, 3]	939,276
Natural gas liquids and liquefied petroleum gases[e]	do.	44,000[r]	45,000[r]	40,000[r]	39,920[r, 3]	37,887
Refinery products:[e, 5]						
Gasoline, motor	do.	13,000[r]	11,000[r]	12,000[r]	16,878[r, 3]	23,830[3]
Kerosene	do.	30,000	45,000	45,000	53,133[r, 3]	59,054[3]
Distillate fuel oil	do.	75,000[r]	84,000[r]	85,000	90,000[r]	95,000
Residual fuel oil	do.	58,000[r]	54,000[r]	55,000[r]	60,000[r]	65,000
Other	do.	86,000[r]	83,000[r]	86,000	86,000	70,000
Total	do.	262,000[r]	277,000[r]	283,000[r]	300,000[r]	313,000
Salt		37,500[r]	42,500[r, 4]	44,700[r, 4]	45,000[r]	50,000
Sulfur:[e]						
Elemental, petroleum byproduct		524,000	634,000	714,000	682,000[r]	700,000
Sulfuric acid		150,000	150,000	150,000	150,000	150,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through July 10, 2006.

[2] In addition to commodities listed, chlorine, clay products, clays, glass, petroleum coke, and sand and gravel were produced, but available information is inadequate to make estimates of output.

[3] Reported figure.

[4] Includes Kuwait's share of production from the Partitioned Neutral Zone.

[5] Excludes liquefied petroleum gases.

TABLE 2
KUWAIT: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement:				
Clinker		Kuwait Cement Co. K.S.C. (Kuwait Investment Authority, 32%, and National Industries Group, 22.4%)	Kilns at Shuabia	1,800,000
Grey portland		Kuwait Cement Co. K.S.C. (Kuwait Investment Authority, 32%, and National Industries Group, 22.4%)	Mills at Shuabia	2,200,000
Do.		Hilal Cement Co. K.S.C.C.	Sulaibiya Industrial Area	(1)
Do.		Portland Cement Co. K.S.C.C. (M.A. Al-Kharafi and Sons Co., 17%)	Shuwaikh	(1)
White		Kuwait Cement Co. K.S.C. (Kuwait Investment Authority, 32%, and National Industries Group, 22.4%)	Kiln and mill at Shuaba	115,000
Iron and steel, steel, rolled:				
Bar and rod		United Steel Industrial Co. (Joint venture of local investors and Ahwaz Steel Commercial and Technical Services GmbH of Germany)	Rolling mill at Shuaiba	500,000
Pipes		Kuwait Pipes Industries and Oil Services Co K.S.C.	Pipe mill at Sulaibiya Industrial Area	120,000
Do.		do.	Pipe mill at Shuwaikh	65,000
Natural gas	million cubic meters	Various[2]	Various fields	13,000
Natural gas liquids		Kuwait Oil Co. K.S.C. (Kuwait Petroleum Corp., 100%)	do.	45,000[3]
Nitrogen:				
Ammonia		Petrochemical Industries Co. K.S.C. (Kuwait Petroleum Corp., 100%)	Plant B, Shuaiba	657,000
Urea		do.	Plants A and B, Shuaiba	639,000
Petroleum:				
Crude	42-gallon barrels per day	Kuwait Oil Co K.S.C. (Kuwait Petroleum Corp., 100%)	South and East Fields (Burgan, Khasman, and Madina Fields)	1,450,000
Do.	do.	do.	North Fields (Abdali, Bahra, Ratga, Matraba, Raudhatain, and Sabiya Fields)	520,000
Do.	do.	do.	West Fields (Abdaliya, Kra' Al-Mero, Managish, and Umm Gudair Fields)	400,000
Do.	do.	Al-Khafji Joint Operations (Kuwait Gulf Oil Co., 50%, and Aramco Gulf Operations Co. of Saudi Arabia, 50%)	Khafji Field, offshore partitioned neutral zone	600,000
Do.	do.	Kuwait Oil Co. K.S.C. (Kuwait Petroleum Corp., 100%)	South Fuwairis and South Umm Gudair Fields, partitioned neutral zone	150,000[4]
Do.	do.	Kuwait Oil Co. K.S.C. (Kuwait Petroleum Corp., 100%) and Saudi ArabianTexaco Inc. (Chevron Corp., 100%)	Wafra Field, onshore partitioned neutral zone	(4)
Do.	do.	Kuwait Gulf Oil Co. (Kuwait Petroleum Corp., 100%)	Hout Field, offshore partitioned neutral zone	(5)
Refined products	do.	Kuwait National Petroleum Co. K.S.C. (Kuwait Petroleum Corp., 100%)	Mina Al-Ahmadi Refinery	415,000
Do.	do.	do.	Mina Abdulla Refinery	240,000
Do.	do.	do.	Shuaiba Refinery	195,000
Salt		Salt and Chlorine Factory (Al Ahlia Industrial Projects Co.)	Shuwaikh and Shuaiba	NA

See footnotes at end of the table.

TABLE 2--Continued
KUWAIT: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Sulfur	Kuwait National Petroleum Co. K.S.C. (Kuwait Petroleum Corp., 100%)	Mina Abdulla, Mina Al-Ahmadi, and Shuaiba Refineries	NA
Do.	Petrochemical Industries Co. K.S.C. (Kuwait Petroleum Corp., 100%)	Plants A and B, Shuaiba	1,320,000

NA Not available.

[1] Marketed imported bulk cement.

[2] Some natural gas is produced from most crude oil production operations in Kuwait and the partitioned neutral zone.

[3] Includes refinery-produced liquefied petroleum gases.

[4] Production from the Wafra Field is included in capacity data for the South Fuwairis and the South Umm Gudair entry.

[5] Production from the Hout Field was temporarily suspended in 2005.

THE MINERAL INDUSTRY OF LEBANON

By Thomas R. Yager

The Lebanese mineral industry continued its historically small contribution to the country's economy. In recent years, Lebanon has been known to produce cement, gypsum, lime, phosphatic fertilizers, phosphoric acid, salt, steel, and sulfuric acid for domestic consumption. Modest deposits of asphalt, coal, and iron ore occur in Lebanon.

Lebanon's cement factories were owned by Ciment de Sibline S.A.L., Cimenterie Nationale S.A.L., Holcim (Liban) S.A.L., and Seament S.A.L. Cement consumption increased to 2.8 million metric tons (Mt) in 2004 from 2.7 Mt in 2003. Holcim (Liban) had a market share of 41.4%; Cimenterie Nationale, 35.3%; Ciment de Sibline, 19.4%; and Seament, 3.9%. In 2005, estimated cement consumption was between 2.6 Mt and 2.65 Mt. Lebanon's cement exports to Iraq and Syria amounted to about 1 Mt and 500,000 metric tons, respectively. Exports increased in 2005 because Iraq's cement plants were operating at 25% of capacity at most, and Syria was experiencing stagnation in cement production as demand rose sharply (Ohrstrom, 2006; Investment Development Authority of Lebanon, undated§[1]).

High electricity and fuel costs inhibited the competitiveness of Lebanon's cement manufacturers. Domestic producers were expected to invest about $150 million in more-energy-efficient equipment by 2008 or 2009. Cimenterie Nationale was likely to spend $80 million; Holcim (Liban) planned to spend $10 million in 2006 on more-efficient generators (Ohrstrom, 2006).

Forest cover declined from 20% of the country's land area in 1975 to less than 7% in 2004 because of civil war, firewood consumption, quarry operations, and urban expansion. In July 2003, the Government decided to shut down all Lebanon's quarries and import sand and gravel from Syria because of the environmental damage reportedly caused by the quarries. Many quarries illegally restarted production in March 2005, particularly in southern Lebanon (Saab, 2004; Daily Star, 2005b).

Lebanon has no petroleum reserves; the country relies on imports for its energy requirements. In the first 11 months of 2005, imports of mineral fuels amounted to nearly $2.1 billion, or more than 22% of total imports. In March, a natural gas pipeline that connected Lebanon to Syria was completed as part of the Arab Gasline project. In the first year of the project, the Deir Ammar power station would produce electricity from natural gas; imports of natural gas were expected to be about 550 million cubic meters per year. Electricité du Liban (EdL) was expected to save $100 million per year as a result of using natural gas instead of fuel oil. By mid-2006, the Zahrani power station was expected to start production of electricity. Imports of natural gas were expected to rise to nearly 1.1 billion cubic meters per year and to result in costs savings for EdL of $200 million per year. In a subsequent phase of the project, imports could rise to 2.2 billion cubic meters per year. The conversion of all Lebanese powerplants from fuel oil to natural gas would save $300 million per year (Iran Daily, 2003; Arab Petroleum Research Center, 2004; Daily Star, 2005a; International Monetary Fund, 2006, p. 18).

Delivery of natural gas to Lebanon was expected to begin in early May 2005. In June, the Government of Syria announced that shipments of natural gas were suspended indefinitely because of technical problems (Rasmussen, 2005).

Lebanon's installed generating capacity was 2,275 megawatts (MW) in 2005; an additional 2,100 MW of capacity was expected to be installed by 2010 to meet increases in demand for electricity. The estimated cost of the new capacity was about $1 billion (Middle East Economic Digest, 2005).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
LEBANON: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004	2005[e]
Cement, hydraulic	thousand metric tons	2,890	2,852	3,500 [r, e]	4,000 [r, e]	4,500
Gypsum[e]		1,600	1,700	1,700	1,700	1,700
Iron and steel, metal, semimanufactures		80,000 [e]	40,000 [e]	--	--	--
Lime[e]		14,000	14,000	14,000	14,000	14,000
Phosphate:[3]						
Phosphatic fertilizers		20,000	30,000	53,000	85,000	85,000
Phosphoric acid		135,000	150,000	166,000	175,000	180,000
Salt[e]		3,500	3,500	3,500	3,500	3,500
Sulfuric acid:						
Gross weight		400,000	480,000	485,000	495,000	500,000
S content		131,000	157,000	159,000	162,000	164,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through November 30, 2006.

[2] In addition to the commodities listed, sand and gravel and other construction materials were also produced, but quantities are not reported, and available information is inadequate to make estimates of output.

[3] P_2O_5 equivalent.

TABLE 2
LEBANON: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Holcim (Liban) S.A.L. (Holcim Ltd., 55.8%)	Chekka	1,800
Do.	Cimenterie Nationale S.A.L.	do.	1,650
Do.	Ciment de Sibline S.A.L.	Sibline	1,200
Do.	Seament S.A.L.	Chekka	500
Phosphate fertilizers	Lebanon Chemicals Company S.A.L.	Selaata	NA
Phosphoric acid	do.	do.	NA
Steel	Consolidated Steel Lebanon S.A.L.[1]	Amchit	300
Sulfuric acid	Lebanon Chemicals Company S.A.L.	Selaata	NA

NA Not available.

[1] Shut down in 2002.

THE MINERAL INDUSTRY OF OMAN

By Philip M. Mobbs

The Sultanate of Oman occupied 212,460 square kilometers of the northeastern tip of the Arabian Peninsula and supported a population of about 2.6 million in 2005. Production of hydrocarbons and processing (petroleum refining and the liquefaction of natural gas) formed the basis of Oman's economy. In 2005, total crude oil production declined by less than 1% compared with a decline of almost 5% in 2004 and an 8.5% drop in 2003. The Government's potential loss of revenue from the production decline again was offset by the average price received for Omani oil, which increased to $50.26[1] per barrel compared with $34.42 per barrel in 2004. Total Government revenues were $11.8 billion in 2005. Government revenue from hydrocarbons increased to more than $9.2 billion, of which crude oil accounted for $8.2 billion, and natural gas, $1.0 billion. In addition to hydrocarbons, chromite, gypsum, salt, sand and gravel, and stone were mined or quarried; ammonia, cement, and urea were manufactured; imported copper ore was smelted and refined; and sulfur was recovered as a coproduct of petroleum processing (Ministry of National Economy, 2006b§[2], c§; U.S. Central Intelligence Agency, 2006§; World Bank Group, 2006§).

In 2005, the Omani gross domestic product (GDP) based on purchasing power parity was estimated to be $40.9 billion and the GDP per capita based on purchasing power parity was reported to be $16,862. In 2005, total merchandise exports were valued at more than $18.7 billion, of which crude oil exports accounted for $13.1 billion; liquefied natural gas, $2.3 billion; base metals and articles, $249 million; refined petroleum products, about $230 million; and other mineral products, $131 million (International Monetary Fund, 2006§; Ministry of National Economy, 2006a§).

Commodity Review

Metals

Aluminum.—Sohar Aluminium Co. [a venture of Oman Oil Co. S.A.O.C. (40% interest), the Abu Dhabi Water and Electricity Authority (40%), and Alcan Inc. of Canada (20%)] awarded the construction contract for an aluminum smelter to the Mining & Metals division of Bechtel Corp. of the United States. The reported capacity of the A35-technology potline ranged from 325,000 to 360,000 metric tons per year (t/yr). The smelter was scheduled to begin production in 2008. A second potline at Sohar, which was proposed to come online in 2010, would double the smelter's capacity (Alcan Inc., 2005; Dow Jones Newswires, 2006§).

Iron and Steel.—Shadeed Iron & Steel LLC (a subsidiary of Al-Ghaith Holding PJSC of the United Arab Emirates) proceeded with the proposed 720,000-t/yr-capacity direct-reduced iron (DRI) module and 500,000-t/yr-capacity steel plant at Sohar. Construction was planned to begin in 2006; initial output was expected in 2008. Iron ore would be imported. Excess DRI would be hot briquetted for export sale. Shadeed also proposed to double the capacity of the facility (Middle East Economic Digest, 2005; Shadeed Iron & Steel LLC, undated§).

Industrial Minerals

Nitrogen.—In July, the 3,500-metric-ton-per-day (t/d)-capacity ammonia and 5,060-t/d-capacity granular urea facility of Oman India Fertilizer Co. S.A.O.C.'s was commissioned at Sur. The company planned to export about 1.6 million metric tons per year (Mt/yr) of urea and 250,000 t/yr of excess ammonia to India. Construction of Sohar International Urea and Chemical Industries S.A.O.C.'s 2,000-t/d ammonia and 3,500-t/d granular urea plant at Sohar was underway. Commercial operations were expected to begin in 2008 (Middle East Economic Digest, 2004; Oman Oil Co., S.A.O.C., undated§).

Mineral Fuels

Natural Gas and Petroleum.—Construction continued on the $690 million 3.7-Mt/yr-capacity natural gas liquefaction plant (train) for Qalhat LNG Co. S.A.O.C. (QLNG). Commercial operations at the QLNG liquefied natural gas train, which was located adjacent to the two-train 6.6-Mt/yr-capacity facility of Oman Liquefied Natural Gas LLC at Qalhat, were expected to begin in 2006. Construction also continued on the 116,000-barrel-per-day (bbl/d)-capacity crude oil refinery of Sohar Refinery Co.; the refinery was expected to begin commercial operations in 2006. Oman Refining Co. LLC planned a $320 million expansion of its crude oil refining capacity to 106,000 bbl/d from 85,000 bbl/d by 2007 (Petroleum Economist, 2005; Kumar, 2005§; SPG Media PLC, 2005§).

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[1] Where necessary, values have been converted from Omani Rials (OR) to U.S. dollars (US$) at the average rate of OR0.386=US$1.00 for 2005, OR0.386=US$1.00 for 2004, and OR0.384=US$1.00 for 2003.

[2] References that include a section mark (§) are found in the Internet References Cited section.

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TABLE 1
OMAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003[e]	2004[e]	2005[e]
Cement, hydraulic		1,369,570	1,700,000 [e]	2,100,000	2,500,000	2,500,000
Chromium, gross weight		30,150	27,444	13,000	18,575 [3]	19,000
Copper, metal:						
Smelter		24,220	25,000 [r, e]	18,000 [r, e]	25,000 [r, e]	25,000
Refinery		24,000 [e]	24,000 [e]	17,000	24,000	24,000
Gas, natural:						
Gross	million cubic meters	19,268	22,366	24,128 [3]	24,150 [3]	23,998 [3]
Dry	do.	14,000	14,800 [e]	17,000 [e]	17,000	17,000
Gold	kilograms	603	188 [e]	4 [3]	--	--
Gypsum		44,323	55,722	50,000	60,000	60,000
Iron and steel, crude steel[e]		10,000	60,000	80,000	90,000	90,000
Natural gas liquids[e]	thousand 42-gallon barrels	6,000	6,000	6,000	6,000	6,000
Nitrogen:						
N content of ammonia		--	--	--	--	620,000
N content of urea		--	--	--	--	320,000
Petroleum:						
Crude and condensate[e]	thousand 42-gallon barrels	352,000	328,000	300,000	285,385 [3]	282,616 [3]
Refinery products:						
Liquefied petroleum gas[e]	do.	366 [3]	545	550	473 [3]	580 [3]
Gasoline	do.	4,198	5,428	5,400	5,215 [3]	5,436 [3]
Jet fuel and kerosene	do.	1,489	2,008	2,000	1,407 [3]	1,770 [3]
Distillate fuel oil	do.	5,338	6,658	6,700	6,442 [3]	7,089 [3]
Residual fuel oil	do.	11,980	14,942	15,000	14,247 [3]	15,445 [3]
Other	do.	666	1,048	1,000	1,162 [3]	1,253 [3]
Total	do.	24,037	30,629	30,700	28,946 [3]	31,573 [3]
Salt		13,983	14,410	15,000	15,000	15,000
Sand and gravel		25,967,815	21,736,414	22,000,000	23,000,000 [r]	24,000,000
Silver	kilograms	3,153	38	--	--	--
Stone:						
Marble		157,249	135,930	140,000	140,000	140,000
Other		3,395,589	3,182,522	3,200,000	3,500,000	3,600,000
Sulfur[e]		30,000	30,000	30,000	30,000	30,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through September 27, 2006.

[2] In addition to the commodities listed, clay for bricks and tile was produced and steel scrap melted, but available information is inadequate to make estimates of output.

[3] Reported figure.

THE MINERAL INDUSTRY OF QATAR

By Philip M. Mobbs

Qatar is located adjacent to Saudi Arabia on a 11,437-square-kilometer peninsula in the Persian Gulf. The nation's mineral output, which was dominated by hydrocarbons, also included the production of clay, dolomite and limestone, gypsum, helium, sand, and shale. Processed mineral-based commodities included ammonia, cement, direct-reduced iron (DRI), lime, methanol, crude steel, sulfur, and urea.

According to the International Monetary Fund (2006§[1]), the Qatari gross domestic product (GDP) based on purchasing power parity was estimated to be about $25 billion[2] in 2005 and the per capita GDP based on purchasing power parity was estimated to be about $31,400. The real GDP growth rate was 5.5% compared with a revised 9.3% increase in 2004. In 2005, the natural gas and oil sector accounted for about 67% of Government revenue and about 66% of the GDP (Qatar Central Bank, 2006, p. 48, 54).

Commodity Review

Metals

Iron and Steel.—In 2005, Qatar Steel Co. (QASCO) proposed to significantly enlarge its production facilities with a $559 million expansion program. QASCO awarded Kobe Steel, Ltd. of Japan the contract to build a $267.4-million Midrex®-process hot-discharge combination plant, which could produce 750,000 metric tons per year (t/yr) of DRI and 750,000 t/yr of hot-briquetted iron (HBI), or up to 1.5 million metric tons per year (Mt/yr) of DRI. Surplus HBI was expected to be exported. DRI output from the new plant would supplement QASCO's existing Midrex®-process DRI plant, which regularly exceeded its 400,000-t/yr-design capacity. In 2005, the old plant produced about 820,000 metric tons (t) of DRI. A subsidiary of Companhia Vale do Rio Doce of Brazil was to provide up to 2.66 million metric tons of iron pellets for the two DRI facilities under a 6-year contract (Metal Bulletin, 2005; Qatar Steel Co., 2005a§, b§; Midrex Technologies, Inc., 2006§).

Danieli & Co. Officine Meccaniche S.p.A. of Italy was contracted to install an 80-t electric-arc furnace and a 600,000-t/yr-capacity continuous-casting plant, which would expand the annual capacity of QASCO's steel plant in Mesaieed to 1.5 Mt/yr. QASCO also awarded a contract to the Voest-Alpine Industrieanlagenbau Group of Austria for the installation of a 700,000-t/yr capacity reinforcing-bar rolling mill, which would expand QASCO's total rolling capacity to about 1.5 Mt/yr (Metal Bulletin, 2005; Middle East Economic Digest, 2005b).

Industrial Minerals

Cement.—Construction continued on Qatar National Cement Co.'s third cement plant at Umm Bab. In December, the newly formed Gulf Cement Co. proposed to build a 5,000-metric-ton-per-day (t/d)-capacity clinker kiln (Peninsula, The, 2005§).

Helium.—The initial liquid helium production from the $115 million Ras Laffan Helium Project began on August 29. Crude helium was extracted from the country's seven liquefied natural gas (LNG) trains and subsequently purified and liquefied.

Nitrogen.—In 2005, Qatar Fertilizer Co. S.A.Q. proposed to build a fifth ammonia and urea production facility (Qafco 5) at Mesaieed. When completed in 2010, the planned $600 million Qafco 5 would increase the company's total production capacity to 4 Mt/yr of urea from 2.8 Mt/yr and to 3.1 Mt/yr of ammonia from 2 Mt/yr (Qatar Fertilizer Co. S.A.Q., 2006, p. 18).

Industrial nitrogen gas was produced at Mesaieed by Qatar Nitrogen Co., which proposed to build an additional 200-t/d-capacity oxygen and nitrogen plant at Mesaieed and a nitrogen plant at Ras Laffan (Middle East Economic Digest, 2005a).

Mineral Fuels

Natural Gas and Petroleum.— Unlike many other countries with natural gas reserves, most of Qatar's gas was not associated with the oilfield production. As a result, gas production was not impacted by the Organization of the Petroleum Exporting Countries production quotas.

In April 2005, the Government announced a moratorium on new natural gas export projects. The suspension of new activity would not affect natural gas utilization programs that were underway. These included the construction of gas-to-liquids plants, additional LNG trains, and international gas pipelines (Gavin, 2005).

In 2005, the Ras Laffan Liquefied Natural Gas Co. Ltd. (II) officially opened the 4.7-Mt/yr LNG train 4. Construction continued on the 4.7-Mt/yr-capacity LNG train 5; completion was expected in 2007. Also in 2005, Ras Laffan Liquefied Natural Gas Co. Ltd. (III) was established and work began on LNG trains 6 and 7. Initial production from the 7.8-Mt/yr-capacity LNG train 6 was scheduled for 2008, and completion of the construction of the 7.8-Mt/yr-capacity train 7 was expected in 2009 (RasGas Co. Ltd., 2005, p. 31; Dow Jones Newswires, 2005§).

Outlook

As long as natural gas is a highly desired fuel and petrochemical feedstock, the economy of Qatar is expected to prosper. With proven reserves of nearly 26 trillion cubic meters, Qatar could provide natural gas to the international market for more than 500 years at its current (2005) production level (BP p.l.c., 2006, p. 22). The abundance of natural gas in Qatar is expected to continue to attract energy-intensive industries, such as aluminum, in addition to more petrochemical facilities.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Where necessary, values have been converted from Qatari rials (QR) to U.S. dollars (US$) at the average exchange rate of QR3.642=US$1.00 for 2005 and QR3.643=US$1.00 for 2004.

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TABLE 1

QATAR: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2001[4]	2002	2003	2004	2005
Cement, hydraulic		1,240,000 [e]	1,340,000	1,400,000	1,400,000	1,400,000
Gas, natural:						
Gross	million cubic meters	37,132	39,000	40,000	50,000	57,000
Dry	do.	27,738	29,300	31,400	39,200	43,500
Helium		--	--	--	--	500,000
Iron and steel:						
Direct-reduced iron		733,549	750,000	780,000	830,000	820,000
Steel, crude		907,608	1,027,000 [4]	1,054,000 [4]	1,089,000 [r, 4]	1,057,000 [4]
Semimanufactures:						
Billet		891,117	275,000 [r]	300,000	300,000	300,000
Bars		713,500	741,000 [r, 4]	747,000 [r, 4]	782,000 [r, 4]	750,000
Natural gas liquids	thousand 42-gallon barrels	26,726	27,000	60,000 [r]	75,000 [r]	100,000
Nitrogen:						
N content of ammonia		1,159,118	1,166,100 [4]	1,185,300 [4]	1,428,000 [4]	1,750,000 [4]
N content of urea		779,388	798,700 [4]	800,000	1,040,000 [r, 4]	1,390,000 [4]
Petroleum:						
Crude	thousand 42-gallon barrels	237,000 [e]	230,000	274,000	287,000	290,000
Refinery products:						
Gasoline	do.	4,948	4,020	14,900	15,000	15,500
Kerosene	do.	3,911	2,450	7,370	7,400	7,500
Distillate fuel oil	do.	3,824	4,340	7,370	7,400	7,500
Residual fuel oil	do.	4,492	2,850	2,880	2,900	3,000
Other	do.	514	2,100	9,560	9,600	10,000
Total	do.	17,689	15,800	42,100	42,300	43,500
Stone, limestone		900,000 [e]	900,000	950,000	1,000,000	1,000,000
Sulfur		220,824	250,000 [r]	300,000 [r]	360,000 [r]	360,000

[e] Estimated. [r] Revised. -- Zero.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through August 31, 2006.

[3] In addition to the commodities listed, clays, dolomite, gypsum, lime, sand and gravel, shale for construction purposes, and methanol are produced in Qatar, but available information is inadequate to make estimates of output.

[4] Reported figure.

THE MINERAL INDUSTRY OF SAUDI ARABIA

By Philip M. Mobbs

In 2005, the Kingdom of Saudi Arabia maintained its position as the leading oil producer in the world. Saudi Arabia had diversified its economy and mineral industry, although the nation's economy remained strongly linked to the hydrocarbon sector, which accounted for about 53% of the gross domestic product (GDP) in 2005 compared with 46% in 2004. The last time that the oil sector had accounted for more than 50% of the GDP was 1981. The surge in the hydrocarbon sector's contribution to the GDP was attributed to the continued increase in international oil prices (Saudi Arabian Monetary Agency, 2006§[1]; U.S. Energy Information Administration, 2006§).

The International Monetary Fund (2006§) estimated that the GDP based on purchasing power parity was about $352 billion[2] in 2005 and that the GDP per capita based on purchasing power parity was about $15,229. The real GDP growth rate was estimated to have increased by 6.6%.

In 2005, the Saudi Arabian Mining Company (Ma'aden) continued the development of the Az Zabirah bauxite mine, the Al Jalamid phosphate rock deposit, and the Zarghat magnesite deposit. Ma'aden also worked on its undeveloped gold resources. Tertiary Minerals plc of the United Kingdom continued its evaluation of the Ghurayyah tantalum prospect.

Several cement companies evaluated gypsum and limestone deposits in Saudi Arabia. In 2005, the fourth consecutive year of increased international oil prices resulted in the continuation of a construction boom in Saudi Arabia. The domestic demand for cement was estimated to be about 27 million metric tons in 2005 and domestic cement producers, which had a capacity of about 23 million metric tons per year (Mt/yr), were unable to meet this demand. A number of capacity expansions or new cement lines were under construction; total installed domestic capacity was projected to reach 33.5 Mt/yr by 2007 (James, 2005).

At Ras al-Zhor, Ma'aden continued work on the development of an alumina plant and a nitrogen and phosphate fertilizer complex. At Jubail, the construction of an ammonia and urea plant for Saudi Arabian Fertilizer Co. was underway. National Titanium Dioxide Co. of Saudi Arabia proposed to expand its titanium dioxide pigment plant that processed imported rutile. Development work continued on numerous other mineral-based commodity projects, especially in the petrochemical and steel sectors.

More-extensive coverage of the mineral industry of Saudi Arabia can be found in the 2004 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Where necessary, values have been converted from Saudi riyals (SRls) to U.S. dollars at the rate of SRls3.75=US$1.00.

TABLE 1
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002[e]	2003[e]	2004	2005[p]
METALS						
Ferroalloys[e]		78,000	75,000	75,000	85,000	85,000
Iron and steel:						
Iron ore		NA	NA	NA	503,500	500,000
Direct-reduced iron	thousand metric tons	2,880	3,290 [3]	3,290 [3]	3,410	3,630
Steel, crude	do.	3,413	3,570 [3]	3,944 [3]	3,902	4,185
Metal ore, mine output:						
Gross weight[e]		2,000,000	2,000,000	2,000,000	2,200,000	2,200,000
Copper content of concentrate and bullion[e]		800	800	800	652 [r, 3]	668 [3]
Gold content of concentrate and bullion	kilograms	5,000 [e]	4,192 [3]	8,769 [3]	8,268 [r]	7,456
Lead content of concentrate[e]		60	60	60	30	30
Silver content of concentrate and bullion[e]	kilograms	15,000	14,000	13,000	14,494 [r, 3]	13,501 [3]
Zinc content of concentrate[e]		3,300	3,000	3,000	1,500	1,500
INDUSTRIAL MINERALS						
Barite[e]		9,000	9,000	9,000	15,000 [r, 3]	15,000 [3]
Cement, hydraulic	thousand metric tons	20,608	22,000	23,000	25,370 [r]	26,064
Fertilizer, phosphatic, P_2O_5 content[e]	do.	150	150	150	295	300
Gypsum, crude[e]	do.	450	450	450	641 [r, 3]	713 [3]
Lime[e]		350,000	350,000	350,000	350,000	360,000
Nitrogen:						
N content of ammonia	thousand metric tons	1,774	1,737 [3]	1,743 [3]	1,726	1,780
N content of urea	do.	1,260	1,241 [3]	1,247 [3]	1,242	1,250
Salt	do.	1,000 [r, e]	1,000 [r]	1,300 [r]	1,530 [r]	1,738
Sand and stone:						
Aggregate	do.	120,000 [e]	120,000	120,000	156,300	190,000
Dolomite	do.	NA	NA	NA	530	498
Granite	do.	NA	NA	NA	716	843
Limestone	do.	NA	NA	NA	32,000	30,600
Marble	do.	NA	NA	NA	82	85
Pozzolana and scoria	do.	152	152	162	320	372
Sand and gravel	do.	NA [r]	NA [r]	NA [r]	33,100 [r]	28,000
Silica sand (glass sand)	do.	NA	NA	NA	625	518
Sulfur, byproduct, hydrocarbon processing		2,344,587 [r]	2,363,614 [r, 3]	2,180,000	2,249,295 [r]	2,716,823
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	58,500	63,978 [3]	67,389 [3]	75,967	81,350
Dry	do.	53,689	57,314 [3]	60,060 [3]	68,000 [e]	72,000 [e]
Petroleum:						
Crude oil	million 42-gallon barrels	2,763 [r]	2,479 [r, 3]	2,958 [r, 3]	3,151	3,309
Condensate	do.	NA	NA	44 [3]	82	89
Natural gas liquids:						
Propane	thousand 42-gallon barrels	130,576 [r]	139,270 [r, 3]	144,837 [r, 3]	148,225 [r]	150,588
Butane	do.	83,220 [r]	91,858 [r, 3]	87,812 [r, 3]	91,060 [r]	94,148
Natural gasoline and other	do.	78,589 [r]	85,810 [r, 3]	68,422 [r, 3]	65,647 [r]	66,299
Total	do.	292,385	316,938 [3]	301,071 [r, 3]	304,932 [r]	311,035
Refinery products:						
Liquefied petroleum gases	do.	13,230	10,340 [3]	10,150 [3]	13,400 [r]	12,740
Gasoline and naphtha	do.	152,230	153,000	171,720 [3]	198,570 [r]	198,870
Jet fuel and kerosene	do.	60,050	59,700	65,550 [3]	66,980 [r]	80,910
Distillate fuel oil	do.	193,770	193,000	215,590 [3]	234,890 [r]	236,370
Residual fuel oil	do.	169,530	158,000	169,380 [3]	172,790 [r]	177,970
Unspecified[4]	do.	8,650	9,180	10,240 [3]	11,490 [r]	13,780
Total	do.	597,460	583,000	642,630 [3]	698,120 [r]	720,640

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through October 30, 2006.

[2] In addition to commodities listed, basalt, carbon black, clays, and methanol were produced, but available information is inadequate to make estimates of output.

[3] Reported figure.

[4] Includes asphalt.

THE MINERAL INDUSTRY OF SYRIA

By Thomas R. Yager

The Middle Eastern nation of Syria was a producer of crude petroleum, dimension stone, gypsum, natural gas, phosphate rock, salt, sand and gravel, silica sand, and sulfur. Other commodities produced in Syria included cement, fertilizers, glass, phosphoric acid, refined petroleum products, steel, and sulfuric acid.

The state-owned General Company for Iron and Steel Products and five privately owned steel plants produced semimanufactured steel. In May 2005, Hares Group Holding GmbH signed an agreement with the Government to increase the billet capacity of the General Company for Iron and Steel Products to 435,000 metric tons per year (t/yr) from 60,000 t/yr, and the rebar capacity, to 410,000 t/yr from 78,000 t/yr. Privately owned JoudCo Steel produced 105,000 metric tons (t) of semimanufactured steel in 2005 compared with 99,000 t in 2004. The company planned to increase its output to 120,000 t in 2006 (Arab Iron and Steel Union, 2005§[1]; 2006§).

The state-owned General Organization for Cement and Building Materials (GOCBM) and Military Housing Cement Group produced an estimated 4.7 million metric tons (Mt) of cement in 2005 compared with 4.76 Mt in 2004 and 4.82 Mt in 2003 (table 1). Cement imports from Lebanon increased because of stagnation in domestic cement production and higher demand. GOCBM planned to increase the national cement production capacity to between 8.5 million metric tons per year (Mt/yr) and 8.9 Mt/yr. The company planned to lease its plants to private investors for a period of 15 years. Ehdasse Sanat Corp. of Iran was building a new cement plant in Hama with a capacity of 1 Mt/yr; this project was expected to be completed by early 2007. In September 2005, Sinohydro Corp. of China signed an agreement with privately owned Farzat Company of Syria to build a cement plant near Damascus with a capacity of 1.8 Mt/yr (Middle East Economic Digest, 2003; Canada-Arab Business Council, 2005; Iran Daily, 2005).

The state-owned General Company for Phosphates and Mines (GECOPHAM) produced phosphate rock at the Alsharqia and the Kneifis Mines. In 2005, production increased to 3.85 Mt from 2.88 Mt in 2004 because Alsharqia's capacity was increased to 3.05 Mt/yr from 1.85 Mt/yr. Between 600,000 and 700,000 t/yr of GECOPHAM's output was consumed domestically in the manufacture of phosphate fertilizers and phosphoric acid; the remainder was exported (General Company for Phosphates and Mines, undated§).

Syria's natural gas production amounted to about 9.7 billion cubic meters in 2004 and 2005; the Government planned to increase production to 12.8 billion cubic meters. The state-owned Syrian Petroleum Company (SPC) planned to develop 15 new gasfields in the Palmyra region and two new gas-processing plants. The plant near Homs would have a capacity of 2.2 billion cubic meters per year, and the plant at al-Thawra, 1.1 billion cubic meters per year. The project was expected to start commercial production in 2007 (Dar al-Fajr Group, 2006).

Syria was expected to start exporting natural gas to Lebanon by May 2005 as part of the Arab Gasline project. In the first year of the project, exports were expected to be about 550 million cubic meters. Exports would rise gradually to nearly 1.1 billion cubic meters per year, and in a subsequent phase of the project, exports could rise to 2.2 billion cubic meters per year. In June 2005, the Government of Syria announced that operations were suspended indefinitely because of technical problems (Arab Petroleum Research Center, 2004; Daily Star, 2005; Rasmussen, 2005).

At the end of 2005, Syria's reserves of crude petroleum amounted to 3 billion barrels. Production of crude petroleum declined to 469,000 barrels per day (bbl/d) in 2005 from 529,000 bbl/d in 2004 and 562,000 bbl/d in 2003. The al-Furat Petroleum Company (AFPC) was Syria's leading producer of crude petroleum; AFPC and Deir ez-Zor Petroleum Company produced light crude. About one-half of Syria's crude petroleum output was refined domestically; the remainder was exported (BP plc, 2005, p. 6, 9).

Outlook

Syria's production of crude petroleum has declined in recent years and is likely to continue to decrease in the near future because of a lack of new discoveries and investment. Production of natural gas is expected to increase in response to likely increases in domestic demand. The expansion of the construction sector is likely to lead to increased cement and steel production.

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TABLE 1
SYRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001[e]	2002	2003	2004	2005[e]
Cement, hydraulic	thousand metric tons	5,005 [r, 2]	4,679 [r]	4,824 [r]	4,757 [r]	4,700
Gas, natural:						
Gross[e]	million cubic meters	7,700 [r]	9,300 [r]	9,401 [r, 2]	9,700 [r]	9,700
Dry	do.	5,590 [r, 2]	6,800 [r]	6,850 [r]	7,100 [r]	7,100
Gypsum		474,004 [r, 2]	350,088 [r]	376,715 [r]	431,561 [r]	440,000
Natural gas liquids:						
Propane	thousand 42-gallon barrels	250 [r]	-- [r]	-- [r]	-- [r]	--
Butane	do.	800 [r]	-- [r]	-- [r]	-- [r]	--
Pentanes	do.	20 [r]	-- [r]	-- [r]	-- [r]	--
Total	do.	1,070 [r]	-- [r]	-- [r]	-- [r]	--
Nitrogen:						
N content of ammonia		138,400 [2]	142,800	161,100	115,000 [r]	120,000
N content of urea		97,700 [2]	88,500	90,700	91,000 [e]	91,000
Petroleum:						
Crude	thousand 42-gallon barrels	212,065 [r, 2]	198,925 [r]	205,130 [r]	193,085 [r]	171,185 [2]
Refinery products:						
Liquefied petroleum gas	do.	2,500 [r]	3,399 [r]	3,318 [r]	3,318 [r]	3,300
Gasoline	do.	10,000 [r]	11,959 [r]	10,739 [r]	11,413 [r]	11,000
Naphtha	do.	4,600 [r]	4,842 [r]	5,812 [r]	7,028 [r]	7,100
Jet fuel	do.	1,500	1,491 [r]	1,618 [r]	1,943 [r]	2,000
Kerosene	do.	600 [r]	495 [r]	301 [r]	448 [r]	450
Distillate fuel oil	do.	32,000 [r]	31,093 [r]	29,139 [r]	30,758 [r]	31,000
Residual fuel oil	do.	34,000 [r]	39,667 [r]	31,921 [r]	30,210 [r]	30,000
Asphalt	do.	2,500 [r]	2,800 [r]	2,500 [r]	2,500 [r]	2,500
Other	do.	900 [r]	950 [r]	850 [r]	900 [r]	900
Total	do.	88,600 [r]	96,700 [r]	86,200 [r]	88,500 [r]	88,300
Phosphate:						
Phosphate rock, mine output:						
Gross weight	thousand metric tons	2,043 [2]	2,483	2,414	2,883	3,850 [2]
P_2O_5 content	do.	613 [2]	770 [r]	750 [r]	890 [r]	1,190
P_2O_5 equivalent:						
Phosphatic fertilizers		69,000 [2]	123,000	91,000	127,000	130,000
Phosphoric acid		57,000 [2]	102,000	73,000	97,000	100,000
Salt		182,073 [r, 2]	145,018 [r]	128,265 [r]	141,445 [r]	140,000
Steel:						
Crude		70,000	70,000	70,000	70,000	70,000
Semimanufactured		60,000	400,000	600,000	800,000	800,000
Stone:[e]						
Dolomite, refractory grade	thousand metric tons	5,000	5,000	5,000	5,000	5,000
Gravel and crushed rock	do.	6,000	6,000	6,000	6,000	6,000
Marble blocks	do.	347 [2]	340 [2]	340	340	340
Sand, construction	thousand cubic meters	450	450	450	450	450
Sand, industrial	thousand metric tons	850	850	850	850	850
Volcanic tuff	do.	650	650	650	650	650
Sulfur						
Byproduct of petroleum and natural gas[e]		16,000	19,000 [r]	19,000 [r]	19,000 [r]	19,000
Sulfuric acid:						
Gross weight		239,000 [2]	344,000	250,000	362,000	360,000
S content		78,000 [2]	112,000	82,000	118,000	117,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.

[1] Table includes data available through November 30, 2006.

[2] Reported figure.

TABLE 2
SYRIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tartous Company for Cement and Building Materials[1]	Tartous	1,802.
Do.		al-Chaba Cement and Building Materials[1]	Aleppo	923.
Do.		Arabian Cement Co. for Cement[1]	do.	898.
Do.		Adra Co. for Cement and Building[1]	Adra	845.
Do.		Syrian Co. for Manufacturing Cement[1]	Hama	432.
Do.		Rastan Co. for Cement and Building Materials[1]	Rastan	131.
Do.		Military Housing Cement Group (Government, 100%)	Musselemieh	336.
Natural gas	million cubic meters	ConocoPhillips Company	Processing plant at Deir ez-Zor	4,750.
Do.	do.	al-Furat Petroleum Company (Syrian Petroleum Company, 50%; Deminex GmbH, 18.8%; Pecten Syria Petroleum, 15.6%; Royal Dutch/Shell, 15.6%)	Processing plant at Omar	2,400.
Do.	do.	Syrian Petroleum Company (Government, 100%)	Processing plant at Palmyra	2,200.
Do.	do.	do.	Processing plant at Jebissa	1,060.
Do.	do.	do.	Processing plant at Suwaidiyah	240.
Nitrogen:				
Ammonia and urea[2]		General Fertilizers Company (subsidiary of General Organization for Chemical Industries)	Homs	256 ammonia; 137 urea.
Fertilizers		do.	do.	109.
Petroleum:				
Crude	thousand 42-gallon barrels	al-Furat Petroleum Company	al-Thayyem	20,000.
Do.	do.	do.	al-Izba	18,300.
Do.	do.	do.	Omar/Omar North	14,600.
Do.	do.	do.	Maleh/Azraq	11,000.
Do.	do.	do.	Sijan	11,000.
Do.	do.	do.	Jarnof/Saban	9,100.
Do.	do.	do.	al-Ward	7,300.
Do.	do.	do.	Tanak	6,600.
Do.	do.	Syrian Petroleum Company	Suwaidiyah, Jebissa, and Karatchok	45,600.
Do.	do.	Deir-ez Zor Petroleum Company (Syrian Petroleum Company, 50%, and Total S.A., 50%)	Qahar	10,200.
Do.	do.	do.	Jafra	4,700.
Do.	do.	do.	al-Mazraa and Attala North	3,700.
Do.	do.	al-Khabur Petroleum Co. (Syrian Petroleum Company, 50%)	Kishma	5,800.
Do.	do.	Tanganyika Oil Co.	Tishreen	2,190.
Refined:	do.	Banias Refinery Company (Government, 100%)	Banias	49,300.
Do.	do.	Homs Refinery Company (Government, 100%)	Homs	39,100.
Phosphate:				
Phosphate rock		General Company for Phosphate and Mines (Government, 100%)	Alsharqia (A and B Mines)	3,050.
Do.		do.	Kneifis	800.
Phosphatic fertilizers		General Fertilizers Company	Homs	450.
Phosphoric acid		do.	do.	165.
Salt		General Company for Phosphate and Mines	Deir al-Zour	72.
Steel:				
Billet		General Company for Iron and Steel Products (Government, 100%)	Hama	60.
Rolled		Merri Family	Tartous	300.
Do.		Arab Steel Co.	Lattakia	250.
Do.		JoudCo Steel	do.	150.
Do.		Middle East Steel Industries	Yabroud	140.
Do.		General Company for Iron and Steel Products	Hama	78.
Sulfur	metric tons	Homs Refinery Co.	Homs	14,600.
Do.	do.	do.	Processing plant at Suwaidiyah	7,410.
Do.	do.	Syrian Petroleum Company	Processing plant at Jebissa	7,300.
Sulfuric acid		General Fertilizers Company	Homs	560.

NA Not available.

[1] Subsidiary of General Organization for Cement and Building Materials, which is 100% Government owned.

THE MINERAL INDUSTRY OF TURKEY

By Philip M. Mobbs

Turkey had a diverse and dynamic mineral industry. The nation was a leading producer of barite, boron minerals, celestite (strontium), chromite, feldspar, limestone, magnesite, marble, perlite, and pumice, and was a significant source of value-added processed mineral commodities, such as cement, ceramics, glass, and steel.

The national economy had stabilized since the economic crisis of 2001; inflation declined to an annual rate of 8.2% in 2005 compared with a revised 8.6% in 2004. The International Monetary Fund (2006§[1]) estimated that Turkey's gross domestic product (GDP) based on purchasing power parity was about $569 billion[2] in 2005, and the GDP per capita based on purchasing power parity was $7,950.

Trade

In 2005, total Turkish exports were valued at about $76.9 billion compared with a revised $67 billion in 2004. Of the total exports in 2005, iron and steel accounted for about $5.8 billion, which was a 4% drop in value compared with that of 2004; crude oil and petroleum products, $2 billion, which was an 82% increase compared with that of 2004; nonferrous metals, $917 million, which was a 38% increase compared with that of 2004; fertilizers and crude ores, $595 million, which was a 19% increase compared with that of 2004; natural gas, $505 million, which was a 98% increase compared with that of 2004; and metalliferous ores and metal scrap, $411 million, which was a 37% increase compared with that of 2004. Total imports were valued at about $110 billion in 2005 compared with a revised $90.9 billion in 2004. Of total imports in 2005, crude petroleum and petroleum products accounted for $12.48 billion, which was a 28% increase in value compared with that of 2004; iron and steel, $6.7 billion, which was a 27% increase compared with that of 2004; natural gas, $7.1 billion, which was a 61% increase compared with that of 2004; metalliferous ores and scrap, $3.6 billion, which was a 7% increase compared with that of 2004; nonferrous metals, $3 billion, which was a 34% increase compared with that of 2004; and coal and coke, about $1.7 billion, which was a 28% increase compared with that of 2004 (T.C. Başbakanlık Devlet Planlama Teşkilatı Müsteşarlığı, 2006§).

Structure of the Mineral Industry

The private sector dominated the country's industrial minerals and metals sectors. In 2005, 47,401 new companies and cooperatives were established in Turkey, of which 453 were mining or quarrying companies. Thirty-nine mining or quarrying companies were closed in 2005 compared with 47 in 2004 (T.C. Başbakanlık Türkiye İstatistik Kurumu, 2006§). The Government's privatization of state-owned companies continued. Establishments divested by the Government's T.C. Başbakanlık Özelleştirme İdaresi Başkanlığı (Privatization Administration) included Eti Alüminyum A.Ş. Genel Müdürlüğü; several fertilizer plants of Türkiye Gübre San. A.Ş.; the petroleum refineries of Türkiye Petrol Rafineleri A.Ş.; and the salt operations of Tütün, Tütün Mamulleri, Tuz ve Alkol İşletmeleri (TEKEL) A.Ş.

Outlook

Numerous copper and gold exploration programs are underway in Turkey. The development of any of the gold prospects would significantly increase the total national gold output. Project development feasibility studies expected to be completed in 2006 included those of the Aliaga zinc oxide recovery project, the Çaldağ lateritic nickel deposit, and the Çöpler gold project. Objections by nongovernmental organizations have delayed the construction of the Cerattepe underground gold mine and pushed back initial production to 2009.

Turkey, which is a major energy transit corridor, connects energy producers in Asia with consumers in Europe. Natural gas from Iran and Russia is piped into Turkey. The South Caucasus gas pipeline is expected to begin deliveries of natural gas to Turkey from Azerbaijan beginning in 2006. Connection of the Turkish natural gas pipeline system with the European gas network could provide an alternative route to allow surplus Eurasian and Iranian natural gas to flow into Europe.

In recent years, crude oil from Iraq moved only intermittently through Turkey to the export terminals of the Çeyhan oil docks; throughput was limited by the frequent sabotage of the Iraqi section of the pipeline. Regular shipments of crude oil from Iraq are not expected resume until the security situation in Iraq is resolved. The Çeyhan docks are expected to export additional volumes of crude oil beginning in 2006 when the delayed Baku-Tbilisi-Çeyhan oil pipeline is expected to start operations.

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T.C. Başbakanlık Türkiye İstatistik Kurumu, 2006 (January 26), Number of newly established and liquidated companies by economic activity, accessed January 12, 2007, at URL http://www.die.gov.tr/ENGLISH/SONIST/SIRKET/k_260106.xls.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

[2] Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars (US$) at the average rate of TL1.35 million=US$1.00 for 2005 and TL1.45 million=US$1.00 for 2004.

Major Sources of Information

İstanbul Maden ve Metal İhracatçı Birlikleri (Istanbul Mineral and Metals Exporters' Association)
Diş Ticaret Kompleksi A-bloc Çobançeşme Mevkii
Sanayi Cad. Yenibosna-Bahçelievler
Istanbul, Turkey
Telephone: +(90) (212) 454-00-00
Fax: +(90) (212) 454-00-01
Internet: http://www.immib.org.tr
Maden Tetkik ve Arama Genel Müdürlüğü (General Directorate of Mineral Research and Exploration)
06520 Ankara, Turkey
Telephone: +(90) (312) 287-34-30
Fax: +(90) (312) 287-91-88
Internet: http://www.mta.gov.tr
T.C. Başbakanlık Türkiye İstatistik Kurumu (Turkish Statistical Institute)
06100 Necatibey Cad. 114
Ankara, Turkey
Telephone: +(90) (312) 425-8442
Fax: +(90) (312) 417-0432
Internet: http://www.die.gov.tr
T.C. Enerji ve Tabii Kaynaklar Bakanlığı (Turkish Ministry of Energy and Natural Resources)
Ionönü Bulvari, No. 27 Bahçelievler
Ankara, Turkey
Telephone: +(90) (312) 212-69-15
Fax: +(90) (312) 286-47-69
Internet: http://www.enerji.gov.tr
T.C. Petrol İşleri Genel Müdürlüğüne (General Directorate of Petroleum Works)
Ziya Gölkalp Cad. No. 41 Poyraz Han
06420 Yenişehir
Ankara, Turkey
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Fax: +(90) (312) 435-23-64
Internet: http://www.pigm.gov.tr

TABLE 1
TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2001	2002	2003	2004	2005[e]
METALS					
Aluminum:					
Bauxite[2]	242,040	287,403	364,306	365,836	475,349 [3]
Alumina, gross weight	145,993	152,869	162,174	169,991	112,558 [3]
Metal, smelter[e]	61,730 [3]	62,501 [3]	63,000	60,000	60,000
Antimony:[e]					
Ore, mine output:					
Gross weight	6,300	4,800	12,500	20,107 [3]	28,000
Sb content	330	250	650	900	1,400
Concentrates:					
Gross weight	1,000	1,000	2,000	3,000 [r]	5,000
Sb content	200	150	400	700 [r]	1,200
Chromium, gross weight (34% to 43% chromic oxide)[4]	389,759	313,637	229,294	506,421	700,000
Copper:					
Mine output, exclusive of pyrite:[5]					
Gross weight	3,467,306	2,942,721	2,620,896	2,356,147	2,946,106
Cu content of ore	56,864	48,253	58,000 [e]	49,000 [e]	48,000
Metal:					
Smelter output, primary and secondary	33,504	32,550	30,400 [e]	11,500 [e]	9,000
Refined[e]	58,400	41,000	45,000	50,000	95,000
Gold[e, 6] kilograms	2,000	5,000	6,500	4,500	5,000
Iron and steel:					
Iron ore:					
Gross weight thousand metric tons	3,932	3,433	3,429	4,120 [r]	4,598 [3]
Fe content[e] do.	2,100	1,830	1,830	2,200 [r]	2,450
Metal:					
Pig iron and ferroalloys:					
Ferrochromium	50,735	11,200	35,393	28,701	26,043 [3]
Ferrosilicon	5,895	7,245	7,000 [e]	--	--
Pig iron	247,598	157,622	181,080	213,210	215,000
Steel, crude including castings thousand metric tons	14,382	16,046	18,298	20,478 [r]	20,960 [3]

See footnotes at end of table.

TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[e]
METALS--Continued						
Lead:						
Mine output, Pb and Pb-Zn ores:						
Gross weight		388,795	375,592	379,250	407,637	450,000
Pb content		17,923	17,352	17,500	18,650	21,000
Concentrates:[e]						
Gross weight		13,000	25,000 [r]	25,000 [r]	26,000 [r]	29,000
Pb content		8,500	16,000 [r]	16,000 [r]	17,000 [r]	19,000
Metal, refined[e]		4,000	4,000	6,000	6,000	6,000
Manganese ore, gross weight[7]		20,000	20,000	18,000	13,751	15,000
Nickel, mine output, Ni content[e]		NA	NA	640	40 [r]	1,000
Silver, mine output, Ag content[8]	kilograms	118,000	79,000	95,000	73,000 [e]	80,000
Zinc:						
Mine output, Zn and Cu-Zn ore:						
Gross weight	thousand metric tons	816	895	930	765	1,000
Zn content	do.	37	46	47	44	50
Concentrates:[e]						
Gross weight		37,000 [r]	49,000 [r]	49,000 [r]	49,000 [r]	53,000
Zn content		25,300	33,100	33,600	33,400	36,000
INDUSTRIAL MINERALS						
Aluminum sulfate, alunite		11,531	11,389	10,458	10,920	11,000
Barite, crude		57,373	106,843	119,648	134,504	157,179 [3]
Boron minerals:						
Run of mine		2,357,592	2,214,064	2,207,092	2,878,930	2,900,000
Concentrates		1,493,361	1,368,000	1,399,000	1,697,000	1,700,000
Refined borates		420,000 [e]	436,000	518,000	715,000	800,000
Cement, hydraulic	thousand metric tons	30,125	32,576	35,077	38,796 [r]	42,787 [3]
Clays:						
Bentonite		674,178	559,224	831,146	850,000 [e]	925,000
Kaolin		574,550	372,344	370,455	536,008	580,000
Other[e]		2,506,061 [3]	2,500,000	2,500,000	2,750,000	2,750,000
Diatomite		10,000	10,000	10,000	10,000	10,000
Emery		13,629	15,418	15,402	7,902	12,000
Feldspar, run of mine		1,510,293	1,766,387	1,862,310	1,983,336	2,200,000
Fluorspar		4,093	5,344	718	880	800
Glass, crude	thousand metric tons	1,141	1,242	1,315	1,229	1,058 [3]
Graphite, run of mine[e]		15,000	1,393 [3]	942 [3]	1,000	6,000
Gypsum, other than that for cement		328,656	264,038	196,668	250,099	250,000
Lime[e, 9]	thousand metric tons	3,200	3,300	3,300	3,400	3,400
Magnesite, run of mine		1,450,031	3,044,440	3,224,278	3,732,952	3,400,000
Meerschaum[e]	kilograms	400	300	200	150	170
Nitrogen, N content of ammonia		67,100 [e]	300,500	289,300	329,400	330,000
Perlite, run of mine		70,738	151,902	136,683	133,829	140,000
Pumice		754,052	820,347	895,616	1,035,975	1,000,000
Pyrites, cupreous, gross weight		662,872	952,094	1,103,872	765,432	800,000
Silica sand, gross weight	thousand metric tons	1,207	1,274	1,283	1,188	1,200
Sodium compounds:						
Salt, NaCl, all types	do.	1,771	2,197	2,243	2,158	2,200
Soda ash, trona[e]	do.	640	825	835	846	850
Sodium sulfate, concentrates		300,000 [e]	562,660	556,575	523,285	550,000
Stone:						
Dolomite		915,441	975,971	1,158,539	2,109,362	2,200,000
Limestone, other than for cement	thousand metric tons	40,572	30,261	28,609	30,963	35,000
Marble	cubic meters	460,834	557,630	544,629	668,996	800,000
Quartzite		2,085,791	2,006,654	2,908,584	2,961,932	3,200,000
Strontium minerals celestite:[e]						
Run of mine		110,000	116,278 [3]	116,000 [3]	100,000	100,000
Concentrates		63,635 [3]	70,000	70,000	60,000	60,000

See footnotes at end of table.

TABLE 1--Continued

TURKEY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[e]
INDUSTRIAL MINERALS--Continued						
Sulfur:[e]						
S content of pyrites		26,000	34,000 [r]	28,000 [r]	20,000 [e]	20,000
Byproduct:						
Petroleum		51,000	48,000 [r, 3]	42,000 [r]	49,000 [r, 3]	54,000 [3]
Other		75,000	75,000	46,000 [r]	19,000 [r]	20,000
Total		152,000	157,000 [r]	116,000 [r]	88,000 [r]	94,000
Talc		883	98	60	60	100
MINERAL FUELS AND RELATED MATERIALS						
Asphalt, natural		150,000 [e]	118,235	217,759	738,915	700,000
Carbon black		35,000	37,413	6,754	32,686	26,820
Coal:						
Hard coal, run of mine	thousand metric tons	3,370	3,313	3,090	2,843	3,050 [3]
Lignite, run of mine	do.	58,173	49,627	43,749	43,754	55,626 [3]
Coke and semicoke	do.	1,890	2,080	2,543	2,855	2,800
Gas, natural, marketed	thousand cubic meters	600,000 [e]	268,000 [e]	275,947	344,196	600,000
Petroleum:						
Crude	thousand 42-gallon barrels	18,370	17,579	16,980	16,270	16,500
Refinery products:						
Liquefied petroleum gas	do.	8,019	8,580	7,960	8,340	8,900
Gasoline	do.	24,993	31,634	28,800	27,350	30,300
Naphtha	do.	16,656	11,947	10,700	12,700	11,500
Jet fuel	do.	9,496	9,368	13,300	14,000	15,800
Kerosene	do.	209	312	540	340	124
Distillate fuel oil[10]	do.	58,901	59,281	53,800	53,660	56,400
Lubricants	do.	1,736	2,090	1,960	2,050	2,400
Residual fuel oil	do.	56,323	53,077	38,600	40,270	42,100
Asphalt	do.	6,661	7,548	8,550	8,430	10,700
Unspecified[11]	do.	5,969	6,125	2,640	3,610	1,050
Total	do.	188,963	189,962	166,850	170,750	179,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through December 1, 2006. In addition to the commodities listed, large quantities of construction materials (clay, sand, and gravel) are quarried. Also mined are basalt, diabase, granite, onyx, sandstone, serpentine, slate, and travertine for building stone, limestone and gypsum for cement manufacture, and garnet, molybdenum, olivine, titanium, tungsten, and zeolite, but available information is inadequate to make estimates of output.

[2] Data are for public sector production only. Data for private sector production are not available, but production is believed to be approximately 30,000 metric tons per year.

[3] Reported figure.

[4] Approximately 70% of gross production is salable product.

[5] Copper mines produce a copper concentrate (of about 22% Cu) and a cupreous pyrite concentrate (of about 0.7% Cu). Copper is not recovered from the cupreous pyrite concentrate.

[6] Data includes estimated content of Turkish copper refinery tankhouse slimes.

[7] Does not include manganiferous iron ore from the Deveci Mine, production of which amounts to several hundred thousand metric tons per year and has a manganese content of from 3% to 5%.

[8] Includes estimated content of base-metals-refinery tankhouse slimes.

[9] Estimated sales only.

[10] Diesel fuel (gasoil) and special heating oil.

[11] Includes refinery fuel and losses.

THE MINERAL INDUSTRY OF THE UNITED ARAB EMIRATES

By Philip M. Mobbs

The production of hydrocarbons and international and regional trade were significant facets of the diversified economy of the United Arab Emirates[1] (UAE). Of the seven emirates, Abu Dhabi accounted for most of the country's crude oil production. Other minerals and mineral-based commodities produced in the UAE included aluminum, ammonia, cement, ceramic tiles, glass, gypsum, sand, steel, and stone. All mineral resources were controlled by the individual Emirates and administered by the Federal Government.

The International Monetary Fund (2006§[2]) estimated that in 2005 the UAE had a gross domestic product (GDP) based on purchasing power parity of about $130.8 billion[3] and a GDP per capita based on purchasing power parity of $27,957. In 2005, crude oil and natural gas, accounted for about 27% of the GDP; the manufacturing sector (which included the production of processed mineral-based commodities), about 15%; the construction sector, about 8%; and other mineral production, 0.2%. Total population was estimated to be more than 4.5 million in 2005. Of the country's labor force of 2.6 million, about 553,000 worked in the construction sector, about 322,000 in the manufacturing sector, about 30,000 in the crude oil and natural gas sector, and about 6,000 in mining and quarrying (Elhage and others, 2006, p. 3, 15).

Trade

In 2005, the value of the UAE's total exports (freight-on-board), which included reexports, was estimated to be about $119 billion, which was up significantly from a revised $91 billion in 2004 and a revised $66.8 billion in 2003. Reexports (the UAE was a significant regional transshipment point) were estimated to account for from 40% to 50% of total exports. The value of crude oil exports from the UAE was estimated to be $43.5 billion in 2005 (about 37% of total exports) compared with $29.6 billion in 2004 (about 33% of total exports). Much of the increase in the value of crude oil exports could be attributed to an increase in the average price received per barrel of crude, which was $52.60 per barrel in 2005 compared with $36.30 per barrel in 2004 and $28.11 per barrel in 2003. Natural gas exports were valued at $5.8 billion, as were exports of refined petroleum products. Diamond exports were valued at $2.2 billion. In 2005, the value of total imports (cost, insurance, and freight) was estimated to be $80.8 billion, of which the import of about 37 million carats of rough diamond accounted for about $1.5 billion (Elhage and others, 2006, p. 10, 36-37; Kuwait Times, 2006§).

Commodity Review

Metals

Aluminum.—In May, Dubai Aluminium Co. Ltd. (Dubal) started potline 7 operations. By yearend, the aluminum smelter's total hot-metal capacity reached 761,000 metric tons per year (t/yr). In August, Dubal commissioned the 80,000-t/yr capacity casthouse 3 and proposed a $285 million 100,000-t/yr-capacity smelter expansion that would add 128 pots to potline 7 and 36 pots to potline 9. In October, Dubal agreed to a 20-year contract to purchase 1.12 million metric tons per year (Mt/yr) of alumina from Guinea Alumina Corporation S.A. (a subsidiary of Global Alumina Corp. of the United States). Global Alumina's proposed refinery in Guinea was expected to begin production in 2008 (Middle East Economic Digest, 2005d, e; Dubai eGovernment, 2005§; Gulf News, 2005§).

Iron and Steel.—Abu Dhabi National Co. for Building Materials proposed to build a 300,000-t/yr-capacity steel reinforcing bar (rebar) rolling mill in the Industrial City of Abu Dhabi. Al-Ghurair Group and ETA Star Holdings proposed to build a 1.2-Mt/yr-capacity rebar rolling mill in Ras al-Khaimah. Al Nasser Industrial Enterprises L.L.C. proposed to build a 250,000-t/yr-capacity crude steel plant (Unit III) at its Emirates Steel Establishment at Mussafah, Abu Dhabi. Emirates Steel's 20,000-t/yr-capacity Unit I, which produced ingot, had come online in 1998, and the 40,000-t/yr-capacity continuous-casting Unit II was set up in 2004. Also at Mussafah, Techint International Construction Corp. was contracted to build a 200,000-t/yr-capacity direct-reduced-iron (DRI) plant for Al Nasser (Middle East Economic Digest, 2005g; Techint-Compañia Tecnica Internacional S.A.C.I., 2006, p. 20; Khaleej Times, 2005§; Al Nasser Industrial Enterprises L.L.C., undated§).

In Sharjah, Al-Tuwairqi Group of Saudi Arabia proposed to build a DRI plant, a rolling mill, and a 1-Mt/yr-capacity steel plant. Qasco Dubai Steel FZE (an affiliate of Qatar Steel Co.) initiated work on a 300,000-t/yr-capacity rebar rolling mill near Jebel Ali, Dubai. The Abu Dhabi government-owned General Holding Co. proposed a capacity expansion of its Emirates Iron and Steel Factory in Mussafah, Abu Dhabi, to 2 Mt/yr of rolled steel from 600,000 t/yr. General Holding also awarded a contract to install a 1.6-Mt/yr-capacity DRI plant at the Mussafah facility to Danieli & Co. Officine Meccaniche SpA of Italy (Middle East Economic Digest, 2005c, i; Techint-Compañia Tecnica Internacional S.A.C.I., 2006, p. 20; Emirates News Agency, 2006§; Al Nasser Industrial Enterprises L.L.C., undated§).

Mineral Fuels

Liquefied Natural Gas.—Abu Dhabi Gas Liquefaction Co. Ltd. proposed to replace Liquefied Natural Gas (LNG) trains 1 and 2 on Das Island with an 8-Mt/yr-capacity LNG train.

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[1] Comprises the following Emirates: Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al-Khaimah, Sharjah, and Umm al-Qaywayn.

[2] References that include a section mark (§) are found in the Internet References Cited section.

[3] Where necessary, values have been converted from United Arab Emirates Dirham (AED) to U.S. dollars (US$) at the rate of AED3.67=US$1.00.

During LNG trains 1 and 2's 27 years of operation, their original combined 2-Mt/yr design capacity had been increased to more than 3 Mt/yr (Middle East Economic Digest, 2005a, b).

Refined Petroleum Products.—Abu Dhabi Oil Refining Co. (Takreer) proposed to build a $4 billion 300,000-barrel-per-day (bbl/d)-capacity export refinery in Fujairah. Upgrades of existing refineries underway in 2005 included work on the Takreer's Ruwais refinery's low sulfur diesel oil and unleaded gas project, which included the installation of new units, such as a naphtha hydrotreater, two continuous catalytic reformers (CCR), a sulfur plant, and a new tank farm. ENOC Processing Co. awarded a $380 million contract for the installation of a 70,000 bbl/d-capacity hydrotreater and CCR at its 120,000-bbl/d-capacity Jebel Ali condensate refinery. Sharjah Oil Refining Co. Ltd. announced an upgrade of the refinery in Sharjah to 85,000 bbl/d from 71,250 bbl/d (Middle East Economic Digest, 2005f, h; Butler Investments, Inc., 2005§).

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TABLE 1
UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2001	2002[e]	2003[e]	2004[e]	2005[e]
Aluminum, primary[e]		500,000	536,000	560,000	683,000	722,000
Cement, hydraulic[e]		6,100,000	7,000,000	8,000,000	8,000,000	8,000,000
Chromium, gross weight[e]		10,000	(3)	(3)	7,089 [4]	(3)
Gas, natural:[e]						
Gross	million cubic meters	54,000	55,000	60,000	61,000	62,000
Dry	do.	41,300	42,000	44,400 [r, 4]	45,400 [r, 4]	46,400
Gypsum[e]		90,000	90,000	100,000	100,000	100,000
Lime[e]		50,000	50,000	50,000	50,000	50,000
Natural gas plant liquids[e]	thousand 42-gallon barrels	110,000 [r]	115,000 [r]	115,000 [r]	115,000 [r]	120,000
Nitrogen:						
N content of ammonia		357,900	363,700 [r, 4]	421,000	380,400 [4]	360,000
N content of urea		250,000 [e]	260,000	400,000	350,000	260,000
Petroleum:[e]						
Crude	thousand 42-gallon barrels	750,000 [r]	675,000 [r]	790,000 [r]	820,000 [r]	830,000
Refinery products:[5]						
Gasoline	do.	11,000	11,400	11,000	20,000 [r]	20,000
Kerosene	do.	30,000	39,000	40,000	50,000 [r]	50,000
Distillate fuels	do.	30,000	34,900	33,800	45,000 [r]	45,000
Residual fuels	do.	12,000	11,300	7,800	20,000 [r]	20,000
Other	do.	30,000	58,300	38,400	65,000 [r]	65,000
Total	do.	113,000	155,000	131,000	200,000 [r]	200,000
Steel[e]		70,000	70,000	50,000	70,000	70,000
Sulfur, byproduct of petroleum refining and natural gas processing		1,490,000 [e]	1,900,000	1,900,000	1,930,000 [r]	1,950,000

[e] Estimated; estimated data and totals are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through November 30, 2006.

[2] In addition to the commodities listed, crude industrial minerals, such as common clays, diabase, gravel, limestone, marble, sand, and shale presumably are produced, but output is not reported, and information is inadequate to make estimates of output.

[3] Negligible or no production.

[4] Reported figure.

[5] Daily production data converted assuming a 365-day operating year and rounded to no more than three significant digits; may not add to totals shown.

THE MINERAL INDUSTRY OF YEMEN

By Philip M. Mobbs

Cement, crude petroleum, gypsum, limestone, marble, natural gas, refined petroleum products, salt, sand and gravel, and stone were produced in the Republic of Yemen. The country, which is located on the southern tip of the Arabian Peninsula, has an area of 527,870 square kilometers and supported a population of about 21 million in 2005.

Production and processing of crude oil accounted for a significant portion of the nation's gross domestic product (GDP). In 2005, the GDP at constant prices (real) was estimated to have increased by 3.8%. Since 2001, the continued drop in crude oil production from aging fields had accounted for an incremental reduction in the annual increase of the real GDP, which rose at a rate of 2.6% (revised) in 2004 compared with 3.1% in 2003, 3.9% in 2002, and 4.6% in 2001. The expected decline in crude oil production in 2005, however, was countered by increased international oil prices. Oil export prices averaged $51.5 per barrel in 2005 compared with $36.6 per barrel in 2004 and $27.9 per barrel in 2003. In 2005, the GDP based on purchasing power parity was estimated to be about $19.5 billion[1] and the GDP per capita based on purchasing power parity was $751 (Central Bank of Yemen, 2006b§[2]; International Monetary Fund, 2006§).

In 2005, the value of exports from Yemen was $6.41 billion, of which crude oil accounted for $5.95 billion; steel products, about $3.95 million; and salt, about $725,000. In 2004, the value of exports from Yemen was about $4.68 billion, of which crude oil accounted for $4.3 billion; steel products, about $4.39 million; and salt, $993,000. In 2005, total imports were valued at $4.71 billion compared with $3.86 billion in 2004 (Central Bank of Yemen, 2006a§-c§).

Commodity Review

Metals

Cobalt, Copper, Gold, Nickel, and Platinum.—Cantex Mine Development Corp. drilled the Suwar cobalt-copper-nickel prospect, which was located about 50 kilometers (km) north-northwest of Sana'a, and continued exploration of the Al Masna'a and the Wadi Qutabah cobalt-copper-nickel-platinum prospects. Cantex also began a drilling program at the Al Hariqah gold prospect, which was located about 130 km northwest of Sana'a.

Zinc.—In March, ZincOx Resources plc of the United Kingdom completed a feasibility study of the Jabaili zinc deposit, which was located about 110 km northeast of Sana'a. In October, Jabal Salab Co. Ltd. [the joint-venture company of ZincOx (60% interest) and Anglo American plc and Ansan Wikfs (Hadramaut) Ltd. (20% each)] signed an exploitation contract with the Government's Geological Survey and Mineral Resources Board (ZincOx Resources plc, 2006, p. 5).

Industrial Minerals

Cement.—Domestic production satisfied less than 45% of the local cement demand. Regional cement shortages caused by the construction boom in the Middle East resulted in an increase in the official cement price to $4.70 for a 50-kilogram bag in June from $3.67 per bag. In many instances, retail cement prices were higher. Expansion of existing cement plants and the construction of new cement plants were planned to meet the local demand. Construction continued on the 1-million-metric-ton-per-year (Mt/yr) expansion of Yemen General Corp. for Cement Manufacturing and Marketing's Amran plant. The state-owned Yemen General Corp. also planned a 200,000-metric-ton-per-year (t/yr) expansion of the Bajil cement plant and a 150,000-t/yr expansion of the Al Barh Factory. Arab Yemen Cement Co. planned to build a 1.2-Mt/yr-capacity cement plant at Mukhalla in Hadramout Province. A local consortium planned to build a 1-Mt/yr-capacity plant at Batis and Star Cement of the United Arab Emirates planned to build a 600,000-t/yr-capacity plant near Aden (Irish, 2006; Hizam, 2005§; Yemen Observer, 2005§).

Mineral Fuels

Natural Gas.—Because Yemen had little gas-gathering infrastructure, most of the natural gas in the country was produced from gas caps associated with oilfields and was flared or reinjected for reservoir pressure maintenance. For a number of years, the gas production from fields on the Jannah and the Marib al Jawf Blocks has been reinjected into the reservoirs in anticipation of the eventual development of a liquefied natural gas (LNG) plant. Yemen LNG Co. Ltd. (YLNG) was formed in 1997 to build and operate an LNG plant; the company was unable to finalize long-term gas-supply contracts with international buyers, however, until early 2005, when 20-year LNG sales and purchase agreements were signed with Tractebel LNG Trading S.A. of Belguim, which was renamed SUEZ LNG Trading S.A. in March 2005 (for 2.5 Mt/yr of LNG), Korea Gas Corp. (2 Mt/yr), and Total Gas & Power Ltd. (2 Mt/yr). YLNG awarded construction contracts to Yemgas (a joint venture of JGC Corp. of Japan, the KBR division of the Halliburton Co. of the United States, and Technip of France) for a two-train 6.7-Mt/yr-capacity plant. Initial production from train 1 was expected in late 2008. Production from train 2 was planned to begin by mid-2009 (Middle East Economic Digest, 2005; Air Products and Chemicals, Inc., 2005§).

Petroleum.—In 2005, the Government terminated Yemen Exploration and Production Co's (YEPC) operations on

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[1] Where necessary, values have been converted from Yemeni Rials (YR) to U.S. dollars (US$) at the average rate of YR191.42=US$1.00 for 2005 and YR184.78=US$1.00 for 2004. The implied purchasing power parity conversion rate was YR147.125=US$1.00 for 2005.

[2] References that include a section mark (§) are found in the Internet References Cited section.

Block 18 (Marib al Jawf) during the initial year of a 5-year extension and renewal of the production-sharing agreement. YEPC subsequently filed for arbitration against the Government. Yemen Hunt Oil Co. had managed the operations on the block for YEPC.

In 2005, crude oil production began from the Hiswah Field on Block 9, which was operated by Calvalley Petroleum Inc. of Canada, and the Nabrajah Field on Block 43, which was operated by DNO ASA of Norway.

Outlook

The Government's economic diversification program would be helped by the development of metal deposits and additional industrial mineral deposits. The construction industry and the economy would benefit from the expected increased cement production when the construction of proposed cement plants and the expansion of existing plants are completed.

The increase of international oil prices in 2005 may encourage additional oil exploration in the future, but high international oil prices were not entirely a positive development for the Government of Yemen. Because of limited in-country refining capacity, the Government imported some petroleum products at international prices and sold them locally at highly subsidized prices (gasoline at $0.69 per gallon and diesel fuel at $0.34 per gallon). In 2005, widespread protests erupted in response to an increase in the official prices of fuels; the price of gasoline, for example, was increased to $1.29 per gallon prior to the protests. Subsequently, the reduction of the official price of gasoline to $1.19 per gallon in July helped quell the protests. Future fuel-price-related civil disturbances could adversely affect the country's economy and investor's interest in the mineral industry of Yemen (Xinhua News Agency, 2005§).

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TABLE 1
YEMEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
Cement	metric tons	1,493,000	1,561,000	1,541,000	1,546,300 [3]	1,550,000
Gypsum	do.	44,000	41,000	42,000	37,000 [r]	38,000
Marble	thousand square meters	101	99	98 [r]	97 [r]	100
Natural gas:[e]						
Gross[4]	million cubic meters	18,000	29,991 [3]	30,000	28,500 [r]	29,500
Flared and used	do.	900	956 [3]	1,000	1,000	1,000
Liquids	thousand 42-gallon barrels	2,400	2,400	2,400	2,400	2,400
Petroleum:						
Crude	do.	165,000	159,924	157,000	147,000 [r]	149,000
Refinery products:						
Liquefied petroleum gas	do.	910	1,100	1,100	800 [r]	900
Naphtha	do.	5,100	3,100	3,500	1,100	1,100
Benzene	do.	7,100	7,200	7,400	8,100 [r]	8,100
Kerosene	do.	3,630	3,450	3,510	3,100 [r]	3,300
Distillate fuel oil	do.	12,500	13,800	16,000 [r]	16,900 [r]	17,000
Residual fuel oil	do.	9,320	6,770	10,000 [r]	9,000 [r]	9,000
Other[e]	do.	420	420	640 [r]	640 [r]	640
Total	do.	39,000 [r]	35,800 [r]	42,200 [r]	39,600 [r]	40,000
Salt	metric tons	95,000	125,000	116,000	88,000 [r]	90,000
Sand and gravel		607	612	624	668 [r]	700
Stone, quarried		2,486	2,288	2,333	2,269 [r]	2,300

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised.

[1] Table includes data available through September 25, 2006.

[2] In addition to the commodities listed, feldspar and silica sand may have been produced, and limestone for cement and rolled steel bars were produced, but available information is inadequate to make estimates of output.

[3] Reported figure.

[4] Most natural gas that was produced was stripped of hydrocarbon liquids and reinjected.

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